RMIT University

Design Standards – Audio Visual

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Version Control

This document will be updated and re-issued to reflect approved change to the content, and is subject to version control. The version record and status is documented below.

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Intent

This document details the role of the ITS Audio Visual group with respect to definition of technology standards relating to Audio Visual systems used throughout RMIT.

Owner

The overall responsibility for these standards resides with RMIT AV, part of the ITS group.

Review

This document is reviewed quarterly from introduction for 12 months. After this period review is conducted every six months.

[1] Printed copies of this document are considered uncontrolled and may not reflect the most recent version

Table of Contents

1 INTRODUCTION 8

2 GENERAL PRINCIPLES 9

2.1 INTRODUCTION 9

2.1.1 Standards and Regulations 9

2.2 Definitions 10

2.2.1 Intellectual property 11

2.2.2 Procurement Panels 11

2.2.3 Authorities 11

2.3 Design for Maintenance and Serviceability 12

2.3.1 Requirement 12

2.4 Workmanship – Installation 12

2.4.1 Work 12

2.4.2 Provision of a fully working system 12

2.4.3 Equipment 13

2.4.4 Supply of equipment & Warranty 13

2.4.5 Delivery, handling and storage/sealed containers 14

2.4.6 Protection 14

2.4.7 Product certification 14

2.4.8 Installation 14

2.4.9 Asset Register and labeling 14

2.5 Locks 15

2.6 Painting and Finishes 16

2.6.1 Requirement 16

2.6.2 Painting - Metalwork 16

2.7 Fastenings 16

2.7.1 Requirement 16

2.7.2 Type 16

2.8 Penetrations 16

2.8.1 Fire Walls, Floors and Structural Members 16

2.8.2 Damp Courses 16

2.8.3 Existing Structures 17
2.8.4 Sleeves 17
2.8.5 Penetration Size 17
2.8.6 Sealing 17
2.9 Acoustic Penetrations 17
2.9.1 Requirement 17
2.9.2 Materials 17
2.9.3 Skirting Ducts 17
2.9.4 Multi Cable Access 17
2.9.5 Single Cable Access 17
2.10 Equipment Racks 18
2.10.1 General 18
2.10.2 Construction 18
2.10.3 Rack top and side panels 18
2.10.4 Ventilation 18
2.10.5 Dimensions 18
2.10.6 Rack Bolts and Nuts 19
2.10.7 Equipment placement 19
2.10.8 Accessories 20
2.10.9 Tamper/Theft protection 20
2.10.10 Cable separation 21
2.10.11 Cable Support – Catenary 21
2.10.12 Cable Support - Tray 21
2.10.13 Cable support Conduits/Ducting 21
2.10.14 Looming/lacing 21
2.10.15 AV and Communications racks 21
2.11 Power & Lighting 22
2.11.1 Power distribution and control 22
2.11.2 Power Cable Test & Tagging 22
2.11.3 Energy Use 23
2.12 Cabling 23

2.12.1 Manufacturer's Recommendations 23
2.12.2 Drawing and Handling Cables 23
2.12.3 Joins 23
2.12.4 Installation 23
2.12.5 Cable Types 24
2.12.6 Fly Leads 25
2.12.7 Separation 25
2.12.8 Protection against Mechanical Damage 25
2.12.9 Bend Radius 25
2.12.10 Labeling scheme 26
2.13 Image projection/display 26
2.13.1 Luminance 26
2.13.2 Projected Contrast 26
2.13.3 Size and position 26
2.13.4 Image geometry 27
2.13.5 Projector mounting 27
2.13.6 Projector Image Shake/Vibration 27
2.13.7 Display mounting 28
2.13.8 Projector settings 28
2.13.9 LCD Panel settings 28
2.13.10 Aspect ratio 28
2.13.11 Perceived image quality 29
2.13.12 Reflected and stray light 29
2.13.13 Projector Screens 29
2.14 Audio Reproduction/Public Address 29
2.14.1 Coverage 29
2.14.2 Gain, Frequency Range and Equalization 29
2.14.3 Quality 30
2.14.4 Signal Delay 30
2.14.5 Hearing Augmentation 30
2.14.6 Induction Loop System 31

2.14.7 Infra-Red System 31
2.14.8 Signage 32
2.15 AV Technologies and Equipment Requirements 32
2.15.1 HDMI 32
2.15.2 HDCP and EDID 32
2.15.3 VGA 32
2.15.3 Matrix and Presentation switches 33
2.15.4 Analogue Video 33
2.15.5 Blu-ray 33
2.15.6 Document Camera 33
2.15.7 PTZ or Fixed Cameras 33
2.15.8 Connection Plates 33
2.16 Control Systems 34
2.16.1 Graphic User Interface 34
2.16.2 Keypad Layout 35
2.16.3 Remote Management 35
2.16.4 Web Access 35
2.17 Miscellaneous Technical Details 35
2.17.1 Operating Environment 35
2.17.2 Mounting and locations of equipment 35
2.17.3 Adjust and clean 35
2.17.4 System hum and interference 35
2.18 Environmental Effects on Audio Visual 36
2.18.1 Lighting 36
2.18.2 Audio 36
3 Deliverables 37
3.1 AS BUILT DOCUMENTATION 37
3.1.1 Package 37
3.1.2 Equipment Schedule 38
3.1.3 Quick Reference Guide 38
3.2 Training 38

3.3 DEVICE ACCESSORIES **39**

3.4 FIRMWARE **39**

3.5 VARIATIONS AND NON-COMPLIANT ITEMS **39**

3.6 DECOMMISSIONING **39**

3.7 RMIT IT NETWORK **40**

3.7.1 TCP/IP Addressing 40

3.7.2 Network Services 40

3.7.3 Network Device Naming Convention 40

3.7.4 IT Data Switches & Cabling 41

3.7.5 Commissioning AV/IT Integration 42

3.8 HANDOVER **42**

3.9 DEFECTS LIABILITY **42**

4 SPECIFICATIONS ***43***

4.1 ROOM CLASSIFICATION **43**

4.2 Design Building Blocks **48**

4.3 Video Conferencing **48**

4.4 Computer/iPad **49**

4.5 Lecture Capture **49**

4.6 Digital Signage **49**

4.7 Glossary, acronyms and abbreviations **50**

A. AV Categories Summary **52**

B. AV00-20 Schematics **53**

C. AV20-70 Schematics **54**

D. AV50-120 Schematics **55**

E. AV90-360 Schematics **56**

F. AV Collab Schematics **57**

G. AVVC Schematics **58**

G. Building Block Schematics **59**

H. RMIT AV Goods List & Minimum Specifications **60**

I. RMIT Handover Approval Form Template **61**

J. RMIT Asset Disposal Authorisation **62**

K. RMIT Standards Amendment History..... 63

1 INTRODUCTION

The Audio Visual department is part of RMIT's ITS group. The department provides AV consultancy, project and procurement support and AV contract management. The AV department consults widely across the University to develop technology strategies to meet the current and future needs of stakeholders, as well as providing clear guidelines around AV architecture, design and procurement. In parallel with this the department works very closely with the RMIT AV Maintenance provider to ensure KPIs and service levels are being met across all of RMITs installed AV infrastructure.

All AV systems throughout the University require involvement, in some form, from the AV department to ensure that consistency, quality, value and fit-for-purpose elements are addressed. This document provides a basis for this, in terms of technology choice and implementation standards.

The first section "General Principles" describes minimum standard requirements for any AV installation within RMIT University. The second section "Specifications" describes in detail, standard room classifications and any specific equipment functionality provided to the end user. These specifications will continue to be developed for the end users based on current and future teaching methodologies/technologies. These standards should be distributed to all AV vendors (including design and integration providers) for all AV works regardless of size and scope.

2 GENERAL PRINCIPLES

2.1 INTRODUCTION

2.1.1 Standards and Regulations

All AV systems must comply with the relevant rules and requirements of the following standards and regulations:

ANSI/INFOCOMM 1M-2009	Audio Coverage Uniformity in Enclosed Listener Areas
AS/NZS3000:2007/Amdt 2:2012	Electrical Installations.
AS/NZS3760-2010	In-service safety inspection and testing of electrical equipment
AS3080:	Integrated Telecommunications Cabling Systems for Commercial Premises.
AS3084:	Telecommunications Installation, Pathways and Spaces for Commercial Buildings.
AS1127 PT 1-9 inc:	Sound System Equipment.
AS1633:	Acoustic Glossary of Terms & Related Symbols.
AS1044	Limits of Electromagnetic Interference
AS1428.1	Australian Standard AS1428.1 (2009) - Design for access and mobility, Part 1: General requirements for access – New building work (AS1428.1)
AS1428.2	Australian Standard AS1428.2 (1992) - Design for access and mobility, Part 2: Enhanced and additional requirements – Buildings and facilities (AS1428.2)
AS1428.5	Australian Standard AS 1428.5-2010 Design for access and mobility - Communication for people who are deaf or hearing impaired (AS1428.5)
AS3159:	Electronic Sound and Vision Equipment.
AS3250:	Approval and Test Specifications – Mains Operated Electronic and Related Equipment.
IEC118-4	Electro acoustics – Hearing aids – Part 4: Induction loop systems for hearing aid purposes – Magnetic field strength
TS 001, TS 008 and TS 009:	ACMA Technical Specifications.
CE marked:	Complying with EEC directives 73/23 “low voltage” and 89/336 “electromagnetic compatibility”.
C-tick:	Complying with Australia and New Zealand EMC Framework requirements.
BCA	Building Code of Australia 2014 (BCA)
DDA	Commonwealth Disability Discrimination Act 1992 (DDA)
	Commonwealth Disability Standards for Education 2005 (Education Standards)
	Victorian Building Act 1993
	Victorian Building Regulations 2006
RMIT AXM Guidelines	RMIT AMX code design guidelines

2.2 Definitions

The following definitions apply to this document:

Accessible	A region to which access may be gained without difficulty, but if necessary by removal of a door, screwed panel, removable ceiling panel or hatch or the like and by use of ladders, planks or similar equipment if needed.
Approved / Approval	Acceptable for the works in the opinion of the Principal. The approval of any documentation or departure for the original scope does not diminish the contractor's obligations.
Authorities	Means statutory bodies or inspectors of such bodies having jurisdiction over the works under relevant current regulations and statutes.
AV Consultant	The Company that provides the overall technical design and direction required to apply the requirements of this document to a specific place. The AV consultant may be either an external consultant from the RMIT Design Panel or the RMIT AV Architect
AV Integrator	The company bound to carry out and complete the AV work (including situations where the AV works is a sub-contract to the Builder).
Contract	The agreement between principle and contractor with reference to the RFP/RFT to complete the works.
Contractor	The company, its staff, agents, or sub contractors that enters in to an agreement to complete the works requested.
Defects Liability Period	Is a set period of time after a project has been completed during which the contractor is obligated to warrant all goods and services supplied.
Install	Set out, erect, mount, align, fix, connect, adjust, integrate test and commission and hand over in proper working order and shall ALSO mean, unless stated clearly to the contrary, supply of the item(s).
Instruction	A direction issued to the Contractor by the principle or their nominated representative
Practical Completion	The Actual date all works are completed and accepted into service, this is nominated by the principle.
Principal	RMIT AV Architect, Senior Manager AV Contracts or nominated RMIT representative.
Project Manager	The role responsible for the project whom will liaise will all relevant parties to schedule and complete relevant works. Depending upon the scale of the project a specialised IT project manager may be assigned to directly manage AV works in addition to the lead project manager.
Provide	Supply, install and commission.
Specialist Contractor	The company that is engaged by the AV Integrator to carry out specialist areas of the AV Contract.

Submit / Review	Supply information to the Principal for review.
Superintendent	Is the project Sponsor or the nominated representative.
Supply	Purchase, obtain, store off site as necessary, deliver to site, and off load, position, store and protect on site.

2.2.1 Intellectual property

The AV Integrator responsible for providing AV services to the University must assign rights in all design and programming to the Principal at Practical Completion. Such rights shall be non-exclusive, but must include the right to modify and/or re-use elsewhere within the University.

This section applies to all programmable devices including, but not limited to, AV switching equipment, control systems and audio DSP devices. All source codes must be provided in a form that is editable by any suitably qualified programmer. The AV Integrator must provide all programs necessary for the authoring and modification of such code.

2.2.2 Procurement Panels

RMIT operates three panels for the procurement of AV Goods, AV Design & Integration, and AV Design services. **These panels must be used for all RMIT projects/purchases involving AV equipment** and services. Please refer to "RMIT AV Procurement Process" for further details.

2.2.3 Authorities

Installed AV systems shall comply with the following, whether or not specific reference has been made in the AV specification:

a) Relevant State or Territory Electricity Regulations

b) Australian Building Codes Board (ABCB)

c) Human Rights and Equal Opportunity Commission (HREOC)

d) Australian Communications and Media Authority regulatory and licensing requirements

e) Workplace Health and Safety

f) AETM Design Guidelines for Tertiary Teaching Spaces

g) RMIT endorsed ANSI / Infocomm standards

All contracting staff members involved in the Design, Install, commission, programing and certification of a RMIT Project shall be certified by the relevant Governing body and be accredited by the manufacturer to perform the required works. The contractor must supply proof of certification in the response to any RFP for both the company and its staff where required.

2.3 Design for Maintenance and Serviceability

2.3.1 Requirement

The AV Integrator shall be responsible for ensuring all installed AV systems are easily maintainable and serviceable by the Principal or their chosen representative. In particular, the following principles shall be adhered to:

a) Where ceiling mounted projectors are installed in spaces with tiered floors or fixed seating, the projector shall be positioned in clear space with a flat floor for ease of access.

b) Projectors must be installed on a motorised lift when:

- Ceiling mounted projectors are installed above raked seating
- Ceiling mounted projectors are installed 3m above finished floor level
- Ceiling mounted projectors are installed in any other situation where easy servicing of the projector would not be possible

When a motorised projector lift is installed it must lower the projector to a service position at 1200mm above finished floor level. Any equipment associated with the projector must be lowered with the projector for serviceability and ease of access. Cables traversing the Lifter's scissor shall be flexible fly leads and suited to the task. All cables feeding the projector shall be terminated at the top of the lifter in an accessible location if the need to replace the flexible fly leads arises.

The AV Integrator shall ensure that all other AV equipment is installed with due consideration to service access.

Control of the projector lift will be via a password-protected page on the touch panel.

To maintain the AV systems intended functionality, User experience, security, and maintainability, the system requires an approved RMIT Teachers station or Lectern. The standard furniture allows for equipment from the AVS Standards to be accessible and uniform in all spaces. The joinery may be existing, be supplied by RMIT Property Services, or the Integrator, this will be defined during the tender process. The joinery will be sourced through RMIT partners.

2.4 Workmanship – Installation

2.4.1 Work

AV Integrators must carry out all work to a high standard in a professional manner using competent and experienced personnel who shall be properly supervised. All work must comply with Australian Standards, University Standards and Industry best practices for AV and ITS.

In all cases the AV integrator shall install the system with the guidance of this document taking into account the workspace the system is being install in. The function of the workspace cannot be compromised by the AV install and the install shall conform to the overall concepts set out in the areas design.

RMIT requires that all contractors follow approved procedures and apply for permits for certain works. Further information is available on the RMIT property services web site or the Project Manager.

2.4.2 Provision of a fully working system

The AV Integrator must supply all items necessary to provide a fully working system in line with the AV specification, design intent and any relevant statutory authority, whether specifically mentioned within the documentation or not.

A fully working system must include commissioning of all subsidiary systems that interface with the AV system, including, but not limited to:

a) AMX RMS

b) University LAN/WLAN/WAN

c) Dimmer/Lighting control

d) Motorised blinds/curtains

e) Joinery, cupboards and locks

f) Lecture Capture

g) Video Conferencing

h) Teaching PC

2.4.3 Equipment

A detailed list of RMIT approved AV equipment is provided in Appendix H.

Alternative products and design approaches may be considered, and approved if deemed equivalent and necessary by the Principal. When nominating an alternative product or design, the AV Integrator / AV Consultant must demonstrate that it meets or exceeds the specification and usability of the nominated equipment or design approach and the reason for the departure from the standard.

AV Integrators shall only use equipment and materials that are compatible with the items and/or systems to be installed. Supply and install all necessary brackets and secondary materials to support the AV equipment.

The Principal reserves the right to reject any proposed alternatives and maintain the specified item to be installed at no cost penalty.

Where a colour is specified for any product (including cables and connectors) it shall be interpreted as a requirement.

The principal may have some of the equipment or licenses needed to complete the installation. This information will be known and conveyed to the Integrator at the design approval stage of the project prior to equipment procurement.

2.4.4 Supply of equipment & Warranty

The Principal will not accept equipment unless:

a) It is procured in a timely manner through formal channels via the manufacturer or their appointed Australian representative.

b) It is fully warranted for commercial use in Australia by the manufacturer.

c) It is well supported in Australia with technical support and spare parts (including timely replacement of faulty parts).

All installations and equipment shall be warranted for a period of at least 12 months from the date of Practical Completion unless otherwise specified.

Warranty details including Make, Model, Supplier, Purchase date, and a unique identifier of the Supplier to enable items to be warranted are to be provided in the Equipment schedule.

2.4.5 Delivery, handling and storage/sealed containers

Deliver, unload and store in a secure area (in accordance with manufacturers' instructions where applicable) to prevent damage, deterioration and loss. If materials or products are supplied by the manufacturer in sealed containers or packages, delivery and storage of the products to point of use is to be the original containers or packages, the exception to this would be Racks and their contents built off site.

2.4.6 Protection

Protect all installed AV equipment for the duration of the project from damage from any source until Practical Completion of the project.

2.4.7 Product certification

Use all products according to any certification requirements. Any product or portions of an installation that needs to be certified shall have the certification documents included in the As-Built section of the deliverables. An example is the Hearing Augmentation System.

2.4.8 Installation

Install materials and equipment in accordance with manufacturer's recommendations, applicable standards and any directions in this document. Clarification from the Principle is required if this document or the specific installation compromises the manufactures direction.

2.4.9 Asset Register and labeling

All installed equipment requires the creation of an asset reference and affixed asset label by the AV Integrator. The Principal will supply the AV Integrator with RMIT asset bar codes.

An asset register template (equipment schedule) will be issued by the Principal at the commencement of the project. The AV Integrator must populate the register with details of all assets install for the project, asset number, serial numbers, locations, MAC addresses, IP Addresses, firmware revision, lockout codes and invoice reference (the duration if asset has greater than 12 months warranty).

Asset labels are to be applied according to the following guidelines:

a) 1 x Asset label to be installed for the following equipment

- Any installed functional equipment installed as part of the installation this includes but not limited to:
  - Rack equipment
  - touch panels *
  - projectors
  - speakers
  - document cameras
  - Microphones*
  - remotes and pointing devices *
  - Chargers and docking stations
  - Active convertors such as HDMI to UTP etc

b) The following equipment does not require asset labels:

- Cables
- passive adaptors
- Connector plates
- The physical rack
- Power supplies associated with equipment above
- Mounting trays and brackets

c) Labels are to be installed as follows:

- **No** Asset labels are to be visible by the users.
- **No** Asset Labels are to be placed on the front of any units.
- 1 on each item
- 1 x mounted on the top, side, rear or bottom of the unit that cannot be removed with part of an options panel/cover or lid.
- Labels are not to cover any serial number, part number, functional label or description on the device
- Labels for portable handheld devices such as microphones are not to be placed on the device. Instead a laminated, printed lookup chart will be attached to the inside of the rack door or enclosure and will state the item name serial number and asset label. Typically these items are identified by * above. A color PDF scan of this chart will be included as part of the deliverables

See the 'Deliverables' section of this document for further information.

2.5 Locks

Where security devices are used for projectors, equipment racks and other AV equipment, the Principal shall make available details of suitable padlocks, locks, barrels etc.

Where joinery works are specifically nominated as part of the AV scope, the AV integrator shall include all joinery locks and barrels to RMIT specification at the AV Integrators cost.

Where AV Integrators are engaged direct by RMIT, the AV integrator is to allow for the cost in their tender response using the table below. The AV Integrator is to allow a minimum 4-week lead-time for RMIT Locksmith to prepare the required security items. Installation of the items is by the AV Integrator.

Lockwwod Lock Code	Lockwood Description	RMIT Key ID	Key Type	Allowence/ExGST
693/SC	693 Pin Tumbler Cupboard Locks	CFS-AV	Twin	$120.00
670/SC	670 Series Cam Locks	CFS-AV	Twin	$75.00
570/SC	570 Oval Door Cylinder	CFS-AV	Twin	$70.00
334/B/45	334B Series Brass Case Padlocks	CFS-AV	Twin	$85.00

Where a Builder is engaged, all locks and barrels shall be provided by the Builder to meet RMIT specifications and requirements.

Where an LCD panel is installed on a wall-mounting bracket a 5mm diameter spilt pin must be installed in the mounting bracket security hole(s). The split pin is to prevent easy removal of the panel without the use of tools.

2.6 Painting and Finishes

2.6.1 Requirement

Finishes shall be selected to suit the application and the surrounding environment of the teaching space. Finishes shall be long lasting, hard wearing and aesthetically appealing.

All finish materials and colours of all visible components shall be coordinated and approved by the Architect and/or Principal prior to procurement.

2.6.2 Painting - Metalwork

When painting metal work, the AV Integrator must consider the following:

a) General Treatment: Prepare surface prior to painting to provide a smooth, clean surface

b) Finish Coats: Powder coat or baked enamel finish to approved colour with minimum thickness of 0.025mm on each surface and edge.

2.7 Fastenings

2.7.1 Requirement

All equipment including projectors, flat panel displays etc, shall be firmly fixed in position. The AV Integrator must obtain all engineering certifications for suspended equipment as required. Selection and installation of the fixing shall be made in accordance with the manufactures Data/Specification information and the engineering advice.

2.7.2 Type

Use threaded fasteners to allow removal and replacement. Galvanised expanded metal anchor type should generally be used in masonry and concrete. Material shall be selected which will avoid corrosion. Select fastener appropriate for duty and loading.

2.8 Penetrations

2.8.1 Fire Walls, Floors and Structural Members

Refer to the BCA for restrictions on size and spacing of penetrations. Do not penetrate without written approval by RMIT Property Services and consent Structural Engineer.

All penetrations must be provided with details of proposed fire rating for penetration.

2.8.2 Damp Courses

Do not penetrate.

2.8.3 Existing Structures

Obtain approval for penetrations through existing structures.

2.8.4 Sleeves

Fit a UPVC sleeve for each penetration through lowermost floor slabs, floor beams and external walls for cables not enclosed in conduit.

2.8.5 Penetration Size

Provide a penetration of diameter 10mm greater than the pipe or sleeve diameter for pipes and sleeves penetrating existing external walls, lowermost slab, or floor beams.

2.8.6 Sealing

Seal penetrations around conduits and sleeves with a weak sand: cement mix, or similar sealing compound approved by the Principle. Seal the space between cables within sleeves with a pliable waterproof compound.

2.9 Acoustic Penetrations

2.9.1 Requirement

Acoustically seal penetrations for cables, conduits, ducts and busways passing through acoustic rated floors and walls to maintain the acoustic properties of the floor or wall.

2.9.2 Materials

Submit details of each type of acoustic seal system proposed. Provide a cable transit system of approved manufacture and acoustic properties where required.

2.9.3 Skirting Ducts

Provide acoustic treatment to skirting ducts where passing through acoustic rated walls as specified above.

2.9.4 Multi Cable Access

Where multiple cables are required to pass through the acoustic barriers enclose cables in a 1.6mm thick sheet steel enclosure packed with 32 kg/m^3 insulation. Seal the duct to the acoustic barrier with a flexible sealant of specific gravity 1.5 or greater. Design the access duct to have at least one 90^o bend prior to penetrating the acoustic wall. Elsewhere, wrap cables in 4.5 kg/m^3 'loaded vinyl' faced with 25mm thick insulation sheet and seal to the acoustic barrier with flexible sealant as specified above.

2.9.5 Single Cable Access

Where single cables are required to pass through acoustic barriers, repair penetration and seal the cable to the acoustic barrier with a flexible acoustic rated sealant.

2.10 Equipment Racks

2.10.1 General

Provide IEC297-compliant equipment racks complete with all equipment fixings, power distribution and control, chassis runners, shelving and ventilation, blank or tamper-proof panels as required. Doors are not required unless specified.

Access to AV Racks or rack location to be secured by AV key access. (Refer to Section 2.5 for type information).

All equipment racks shall be powder coated in non-reflective black, including cable trays and shelving, unless otherwise specified.

All racks shall be fixed down with clear access to both front and rear to ensure ease of service to the AV system.

2.10.2 Construction

Equipment racks shall be welded steel or other metal construction approved by the Principal. Provide a combination of blank and vent panels to cover all spare slots whilst ensuring proper airflow. As a guide to AV Integrators, the following manufacture/models noted meet the required quality:

a) All racks other than those installed into a lecterns, closed joinery or where access to the rear of the rack is difficult shall be:

- MFB Series 2005B
- Elgee Zip Rack
- Rack Technologies 19” C series

b) All racks equal or less than 12RU installed into a lectern, closed joinery or where access to the rear of the rack is difficult shall be:

- Middle Atlantic SRSR4xx series, or equivalent

2.10.3 Rack top and side panels

Supply colour-matched side and top panels from the same series as the racks. Where multiple racks are installed side-by-side, bolt adjacent racks together via baying kit and provide side panels for the outer faces only.

All panels are to be secured to prevent unauthorized access or removal of equipment installed within the rack

2.10.4 Ventilation

Ensure adequate ventilation for all mounted systems. Natural ventilation shall be used wherever possible and appropriate. Coordinate size of ventilation louvers or equivalent in joinery with builder. Racks above 24U or wherever a large heat load is generated shall have a vented top panel or ‘pop top.’ Rack mounted mechanical ventilation units shall be provided where natural ventilation is not sufficient. Noise produced by ventilation units shall not be audible in the audience or presentation areas.

2.10.5 Dimensions

Where not specified, rack height shall allow installation of all nominated equipment and necessary ventilation plates, as well as provide convenient access to equipment for maintenance and programming. Racks shall allow a minimum of 20% spare capacity for future equipment.

Equipment racks 24RU or less shall have a minimum depth of 600mm. Equipment racks larger that 24RU shall have a minimum depth of 700mm. Where rack footprints are specified they shall be read as a requirement. AV Integrator shall allow for fitting of standard and nonstandard height/width rack mount equipment.

The minimum width for a rack opening in joinery or built cupboards is 600mm clear of all obstacles. The 600mm is not to be encroached on by hinges, locks, handles services terminated in the cupboard. When positioning a rack or joinery for a rack the service position must be taken into account to ensure the rack is not fouled in anyway. The serviceability of the rack and its equipment is key to the maintaining the system and having a timely response to system outage calls.

When installing smaller equipment racks within joinery, the rack shall be able to be removed from the space and pivoted ninety degrees to provide clear access for maintenance without straining any connected cables.

2.10.6 Rack Bolts and Nuts

For equipment racks:

a) M6 zinc plated cage nut installed in every rack position

b) M6 black or bright nickel-plated steel bolt with Phillips' pan or dome head. Slotted bolts and those with a countersunk head shall not be used.

c) Plastic cup washer to suit

d) Fibre and steel washers shall not be used

e) In cases where security screws are required they shall be Snake Eye security screws to be suited to size 14 snake eye driver bits.

2.10.7 Equipment placement

Place any equipment required by the user at an appropriate height to facilitate easy loading of media. Equipment in this category included DVD, Blu-ray, PCs etc. Ensure the controls on user accessible equipment and the DVD drive and USB ports on PCs are visible and accessible, especially in short racks. Note: Rack doors may require a cut out to facilitate access to PC.

Place all other equipment in racks/joinery with regard to:

a) Efficient cooling

b) Ensure vents are unobstructed

c) Allow extra space around/between amplifiers etc

d) Serviceability

e) Access to front and rear for programming, cabling etc

f) Logical cabling

g) Group like cables where appropriate

h) Maintain appropriate cable segregation

i) Reduce inter-rack cabling

j) Occupational health and safety

k) Place heavy equipment low in the rack

2.10.8 Accessories

Equipment racks shall be provided with any accessories required to provide a complete system including, but not limited to:

a) Rack trays

b) Vent panels

c) Blank panels

d) Commercial power strips or Power Distribution Units (domestic power boards are unacceptable)

e) Looming/lacing bars and other cable management devices

f) Support brackets

g) Doors (where specified)

2.10.9 Tamper/Theft protection

To ensure continued correct operation after AV systems have been equalized and calibrated, install tamper proof devices over any exposed knobs, switches or other controls on:

a) Amplifiers

b) AV switcher

c) Signal processing equipment

d) Any equipment with front-panel power switch

e) Any equipment where operation of front panel controls may affect operations via the control system

Devices with only configuration or selection buttons on the front panel such as AV switchers, receivers etc shall be secured by manufacturer based lockout codes where available.

Devices which can be reconfigured over the University network, or equipment with network management interfaces shall be secured in a manner compliant with RMIT security policies. Devices that cannot be secured by means of a password (minimum requirement) must assessed and approved by the Principal for use as a precaution.

To prevent theft or unauthorised removal of equipment, the following security measures are to be used:

a) Rack equipment must be secured by locked door or security screws where no door is installed

b) Non rack styled mounting equipment, is to be secured by screws, industrial velcro or foam backed double sided tape

c) Elmo style document cameras are to screwed from underneath provided screw heads are secured by a locked door or screwed panel.

d) USB and other portable items are to be secured by combination Kensington brand lock. Code to be set to 1988

e) Revolabs and handheld microphone base stations are to be secured with industrial strength foam backed double sided tape

2.10.10 Cable separation

AC power cable and feeder cable for hearing augmentation loops shall be separated from all other cables according to standards and to manufacturers' specification.

High level signal cables, low level signal, RF and control caballing shall be separated where possible. Minimum separation between AV cabling and other services must not be less than 150mm. Separation between AV cabling and electrical services must be minimum 300mm and only cross at right angles.

Cable runs must be parallel or at right angles to the building line.

2.10.11 Cable Support – Catenary

Where required, catenary wires must be installed for supporting cabling, and must be of adequate strength to carry the cables attached to them. Method and intervals of fixing of cabling to catenary wire must comply with the manufactures installation documentation.

Catenary wires must be securely anchored to the floor slab of the floor above or wall. The maximum sag of any span of a maximum 7-metre length of each catenary wire must not exceed 100mm.

Catenary wires are not to be used in exposed ceilings.

2.10.12 Cable Support - Tray

Generally in a new building or fit out Audio visual cabling will have allowances made by the electrical contractor for space allowance on the Communications Cable Tray to reduce services space in the ceiling.

2.10.13 Cable support Conduits/Ducting

Where cables leave a tray or a catenary in a situation where they are exposed the cables shall be enclosed in conduit or duct (i.e. Aussie duct or equivalent). In either case the conduit/duct shall have the nominated space spare set forward in the relevant Australian standards. The cables must exit the conduit/duct through a cable gland or pass through, open ended conduit or ducting is not acceptable.

2.10.14 Looming/lacing

Dress all cables within the equipment rack in neat looms and parallel runs using approved cable restraints and support bars. Leave sufficient length on all cables to allow removal of any item of equipment from the rack for a distance equal to the equipment depth + 50% without disconnecting any cables.

Cable bundles shall not obstruct installation or removal of equipment in the racks. Cover all cables entering and exiting the equipment rack with appropriately sized Techflex or equivalent black expandable braid cable sock. Cut expandable braid with a hot knife or otherwise treat sleeve ends to prevent fraying.

Cable ties are to be installed with a suitable tensioning tool and the AV Integrator is to ensure that no sharp edges remain when the 'tail" is trimmed and it is flush with the locking block.

Cable ties are not to be used on CATx or coaxial cables. Velcro ties must be used to ensure that the cable is not distorted during installation.

2.10.15 AV and Communications racks

All AV equipment shall be housed separately from IT communications equipment and must not reside in the same cupboard or rack.

2.11 Power & Lighting

2.11.1 Power distribution and control

Where indicated on the schematics, distributed power within equipment racks shall be controlled by means of a network based, rack mounted, power distribution unit. Double-adaptors and single-pole switched power strips must not be used. AV integrators must size the power strip to suit the rack and number of devices connected. A provision for 20% expansion must also be provided. Power strips shall be protected by accessible circuit breakers (10A on normal circuits).

Unless otherwise specified, provide switching of powered devices as follows:

a) Un-switched remote equipment (local GPO power)

- Projectors and other display devices

b) Un-switched rack equipment (power distribution unit in rack)

- Control system
- Installed PC
- Teleconference interface and Videoconference codec
- DSPs (if required for hearing augmentation).
- Any items of equipment required to ensure that the boundary microphone is active for hearing augmentation whilst the AV system is shutdown.
- Hearing loop amplifier

c) Instant switched rack equipment. Equipment is immediately powered when AV system is activated. (power distribution unit in rack)

- Document camera
- Blu-ray Player/DVD
- MATV or IPTV receiver
- Matrix switches (if not integrated with control system or used for hearing augmentation).

d) Delayed switched rack equipment.

- Audio amplifiers
    - Are to be energised 5 seconds after all other audio equipment
    - Are to be de-energised 5 seconds before all other audio equipment

Shorten power cables to an appropriate length and terminate in Australian-standard side-entry mains plug-tops similar to Clipsal 418S or IEC style connectors.

All outlets must be clearly labeled on the control system technical page to allow for power cycling of individual units.

2.11.2 Power Cable Test & Tagging

All power cables supplied are required to be tested and tagged to the AS 3760 standard. A copy of the register of cables shall be supplied as part of documentation package.

2.11.3 Energy Use

In order to align with RMIT's Energy Management policies, power consumption of all active devices must be considered when selecting appropriate technologies. Power ratings when operating, low power, sleep and off modes will be used in order to select the most energy-efficient component.

The Integrator must ensure correct operation of equipment when selecting efficiency mode.

Section 4 RMIT Design Standards - Energy Management provides further general information regarding the policy and its application to building services design. More information is available on the RMIT Property Services website.

2.12 Cabling

2.12.1 Manufacturer's Recommendations

Install, terminate and join cables in accordance with the manufacturer's recommendations.

2.12.2 Drawing and Handling Cables

Ensure that cables do not exceed the manufacturer's specified pulling tension when drawing cables.

2.12.3 Joins

Cables shall be run without junctions or joins except where prohibited by site conditions. The number of termination points along a single signal path shall be kept to a minimum and must always be less than the stipulated limit of termination points or junctions.

2.12.4 Installation

Cables shall be concealed wherever possible unless specified otherwise. Cables shall be run in the shortest practical route, in a manner causing the least strain and be supported using conduit or duct and cable tray where necessary. The least preferred method of cable support is catenary wires or hangers.

Proposed cable routes and installation methods are generally shown on the drawings and/or described in the specification. Where a more suitable route is found the approval of the Principal shall be required.

Provide any cable ties, hangers, trays and other cabling management equipment required to ensure that there is no strain on cables or connectors. Provide draw wires in all ducts to allow for accessibility and ease of operation if unused. Keep all cable access hatches and openings free and clear of dirt and debris. Provide adequate protection of cable ends from damage during installation. Where minimum segregation cannot be achieved, AV cabling is to be run in continuous earthed metal ducting/conduits separate from AC power cable.

Speaker level audio, line level audio, (low level) microphone audio, video, control, extra low voltage power and data cables shall be suitably segregated from each other so that EMI is minimised. All cable runs shall be neatly laced, dressed and adequately supported. Cable bundles shall be tied using approved cable fasteners such as Velcro straps. Plastic cable ties must not be used for looming.

2.12.5 Cable Types

Of the following signal types only the following of cable types should be used unless agreed to by the Principal:

Cable Type	Description	Belden	Turnbull Electric
Digital Video	HDMI, DVI and Display Port	See Fly leads	See Fly leads
Digital Audio	110 ohm (Belden – Purple PVC jacket)	BELDEN 1800B	TC2102DA
Analogue Video	RGBHV Coax in single sheath	BELDEN 7789A	TC9501-5
Analogue Audio – Balanced stereo	26 AWG stranded 2 pair twisted core with aluminium foil and drain	BELDEN 1172A	TCSPEC003
Analogue Audio – Unbalanced mono/stereo	1 Pair shielded 22AWG	BELDEN 8761	TCAP01E
Speaker - Low impedance	12 AWG stranded 2 core Double insulated, striped, multi strand.	BELDEN 1311A	TCUP01-3
Speaker – High impedance	16 AWG stranded 2 core tinned copper conductors, PVC insulation, twisted pair, PVC jacket.	BELDEN 8471	TC002-1.1
RS232/485	24 AWG two pair data with aluminium foil	BELDEN 8723	TCIP02E
Relay	24 AWG two pair data with aluminium foil	BELDEN 8723	TCIP02E
Digital I/O	24 AWG two pair data with aluminium foil	BELDEN 8723	TCIP02E
STP	Cat 6A **Purple** PVC jacket	Kramer, Extron, Device manufacturers specification or equivalent	
ELV Power	Double insulated 1.5mm^2		

All other cable requirements will be addressed with a professional grade cables including (but not limited to) fibre, VGA, high bandwidth digital video (HDMI and DVI) and be fit for the intended purpose.

In general the patch leads shall be pre-made, all patch leads shall be of a suitable length and with a minimum of length spare.

All network cabling must comply with RMIT Design Standards Brief – Section 10 Communications. See Section 10.4 for specific details.

Installed HDMI cables must comply with the requirements in section 2.15.1.

All performance/acceptance testing is to include patch and fly leads. Typically a maximum Native HDMI cable run should not exceed 15mtrs including patch and fly leads. For distances greater, CATx based extenders must be used.

USB extenders and high bandwidth video extender devices are permissible where nominal cable lengths are not sufficient. Cables used for this purpose must be clearly labeled as AV cables at both ends to avoid confusion with data networking cables.

All UTP/STP CATx cabling used must be distinguishable from data networking cabling and must be provided with a purple coloured PVC sheath.

2.12.6 Fly Leads

The AV Integrator shall provide all necessary AV fly leads for every connection plate and all patch leads necessary to enable the connection of the system. All leads must be of reputable manufactured and be fully tested. The AV integrator must ensure that all leads are factory pre-molded, of suitable size to fit within cable trenches and ducts.

Fly leads must be of sufficient length but not excessive for easy connection to the device when located in its typical location. Fly leads with excessive length will be rejected by RMIT and will be replaced at the integrators expense.

Where multiple fly leads are provided at a single location, then they must be contained in a suitable tight fitting woven nylon cable sock or similar. Where a Laptop loom, or any other loom requiring Ethernet is created, the AV integrator must supply and include a CAT6(A) fly lead as part of the loom.

Fly leads installed in student or public spaces must be secured to prevent unauthorized removal. Nylon P-clips or other similar methods are acceptable.

Where a push button controller is installed, the VGA and HDMI fly leads must be clearly labeled to match the wording on the appropriate push button i.e. Laptop VGA, Laptop HDMI.

Fly leads provided to connect user equipment must be of the following:

Type	Manufacture / Model	Connectors	Length
HDMI	Extron HDMI Ultra, Kramer C-HM/HM/PRO	HDMI – HDMI	0.9-3m
VGA + Audio	Extron MVGA-A M-M, Kramer C-MGMA/MGMA	VGA (M) – VGA (M)	0.9-3m
USB	Generic – USB 2.0	USB (M) – USB (F)	1.0-3m
Data	Krone - CAT6/CAT6A TBC with project documents.	RJ45 – RJ45	1.0-3m

2.12.7 Separation

Maintain separation distances required by Standards and other applicable codes and regulations between power/lighting circuit cabling, communications cabling and other cabling and services.

2.12.8 Protection against Mechanical Damage

Wiring systems installed in locations where there is a risk of mechanical damage shall be adequately protected in accordance with but not limited to AS 3000, AS3080, TS 001, TS 008 and TS 009:

2.12.9 Bend Radius

In order to maintain cable integrity and signal performance, cables shall not be bent beyond its manufacture's recommendation. Bend requirements must be specifically adhered to for all HDMI, Category 6 and Fibre optic cabling for during the installation and as installed as they may be different.

AV Integrator shall observe manufacturers' recommendations regarding cable bend radius, or where unspecified bend at no less than eight times the overall diameter of the cable. Cables should be anchored immediately before the start and after the finish of the bend. Provide all patch bays and wall, floor & ceiling outlets plus associated patch cables as required providing a fully functioning system.

2.12.10 Labeling scheme

The AV integrator shall present a cable labeling scheme for the facility and submit for approval by the Principal., Submit details of proposed cable, connection plate and patch bay labeling scheme to Principal prior to manufacture / procurement. No variation costs shall be accepted for re-labeling of unapproved or rejected labeling.

Labeling scheme shall include:

a) Robust, repeatable labeling

b) Cable labels are self-laminating vinyl similar to Brady WML-305-292-2S with laser or other indelible machine printed text. Labels shall be protected from physical damage and be clearly legible.

c) Connector and patch plates shall be directly engraved with appropriate legends

d) AV Integrator's name or logo may be included on cable labels only where it does not impact on the legibility of the specified information. AV Integrator's name or logo is not to appear on any plates.

e) Logical sequential system for ALL cables

f) Label ALL equipment and cables to facilitate simplified operation and maintenance.

g) Label both ends of all cables with an approved labeling system. Labels shall be placed to ensure ease of identification.

h) Submit a sequential cable numbering system for approval by the Principal.

i) Labels shall include cable number, signal source and destination information

j) A copy of the as-built cable schedule shall be included in the operation manual.

k) Shielded CATx cables used for AV purposes (e.g. video/USB extenders) must be clearly labeled as AV cables at both ends to avoid being connected to incorrect devices.

Pen or permanent ink marked labels will not be accepted.

2.13 Image projection/display

2.13.1 Luminance

Screen luminance at all points on the screen shall be no less than 50 nits. Luminance at the edges of the screen (5% in from each edge) should be not less than 75% and not more than 90% of that at the center. The distribution of screen luminance should be symmetrical about the geometric center of the screen.

2.13.2 Projected Contrast

When the room lighting is set for projection viewing, the ratio between ambient black (i.e.: light incident on the screen from ambient sources and room lighting) and projected white shall be a minimum of 7:1. Contrast ratios greater than 10:1 are preferred.

2.13.3 Size and position

Unless otherwise specified, all systems in this facility are specified for the projection of data.

All images shall meet the following criteria. Where all criteria cannot be simultaneously met due to the layout of seating, they shall be applied in order:

a) Distance to furthest viewer shall be no more that 5.3 times the height of the displayed image

b) If the 5.3 Ratio cannot be maintained due to physical constraints the ratio can be extended to a maximum of 6 with prior written approval from the Principal.

c) No viewer's sightline to the top edge of the screen shall be more than 35º from horizontal. The center of the image should not be more than15^{o} from the horizontal.

d) No viewer's sightline to the opposite vertical edge of the screen (furthest screen when multiple displays are specified) shall be more than 45º from straight ahead

e) Distance to the closest viewer shall be no less than twice the height of the displayed image

In all cases the bottom of the projected image should be at least 1200mm above finished floor level.

Where an interactive white board is installed the top of the whiteboard is to be a maximum of 2100mm above finished floor level. Note: depending on board size the bottom edge of the image may be a minimum of 850mm above finished floor level.

2.13.4 Image geometry

The projected image shall be rectangular with parallel edges and 90º corners. Optical image correction via lens shift may be used to correct image positioning. Digital correction of 'keystone' or other geometric aberrations must not be employed without prior approval from Principle.

2.13.5 Projector mounting

Projectors shall be installed on a University approved secure ceiling mount bracket adequately fixed to the buildings structure. The bracket must include an adjustable dropper, configured to align with the top of the projection screen. Electronic image adjustment shall not be used unless specifically nominated by the Principal.

Installation of the projector bracket must be coordinated with other services to ensure that other ceiling mounted utilities such as sprinkler systems, mechanical ducts and light fittings do not interfere with the size and quality of the projected image.

The AV Integrator is required to verify that the mounting surface will support the weight of the projector, mounting bracket and associated loads imposed during maintenance (technical supporting themselves on the mounting bracket as they service the projector or climb the ladder.

Projectors mounts must include an equipment cage to securely house twisted pair receivers and other associated components and power supplies.

Projectors mounts must be include provision to fit an RMIT approved locking mechanism to prevent theft and damage.

2.13.6 Projector Image Shake/Vibration

Protection image shake is a very real problem in both new building projects and refurbishment projects. This issue is not always evident prior to the installation of the system. RMIT look toward its integration partners to actively identify possible vibration problems that may occur throughout an install. If the image shows signs of vibrations the principle must be contacted immediately.

The possibility any form of image degradation should be investigated during the room scoping at the time of tender.

Installation methods used by the Integrators shall not cause, or exaggerate vibrations in the image.

2.13.7 Display mounting

LCD panels shall be installed on a University approved secure mounting bracket. The bracket should be purpose designed to suit the mounting orientation (landscape, portrait, tilt, swivel, wall or ceiling mounted).

When ceiling mounting displays, the bracket must be coordinated with other services to ensure utilities such as sprinkler systems, mechanical ducts and light fittings do not interfere with the operation of the display.

When mounting to walls the AV Integrator is to ensure that there are sufficient studs or noggins to allow for secure mounting of the display and that the wall is able support weight of the panel and any additional loads such as people leaning on or against the display.

2.13.8 Projector settings

As a minimum the integrator must configure all projectors for the following functionality:

a) Projector background when no image or mute mode set to black

b) All onscreen display functionality is disabled

c) Internal speaker is muted

d) Projector image is muted during “soft off”

e) All external buttons and controls are disabled to prevent unauthorised access. Lockout password is to be 1988, if this is not available then the integrator is to nominate. All password and lockout procedures are to be documented in the appropriate column on the equipment schedule. Where the projector buttons cannot be lockout all functional settings must be reinstated by the control system at power up to ensure the projector will operate correctly after any unauthorised changes

2.13.9 LCD Panel settings

As a minimum the integrator must configure all projectors for the following functionality:

a) Internal fans are set to auto

b) All onscreen display functionality is disabled where possible

c) Internal speaker is operational

d) All external buttons and controls are disabled to prevent unauthorised access. Lockout password is to be 1988, if this is not available then the integrator is to nominate. All password and lockout procedures are to be documented in the appropriate column on the equipment schedule. Where the projector buttons cannot be lockout all functional settings must be reinstated by the control system at power up to ensure the projector will operate correctly after any unauthorised changes

2.13.10 Aspect ratio

All projectors used in this facility shall have native widescreen resolution of 16:10 with a resolution of either WXGA (1280x800) or WUXGA (1920x1200). LCD/LED panels shall be FHD (1920x1080). All displays shall truly reproduce incoming signals in their correct aspect regardless of the display’s native aspect ratio. This should be achieved through control system programming, with users selecting correct aspect by an intuitive interface.

Any resolution or aspect that differs from the above shall be approved by the principle i.e: 17:10 5120x2880 UHD+

For permanently installed equipment (DVD, PC etc) the default aspect ratio shall be predetermined and no option presented to the user unless specified.

For portable equipment connected via VGA then the option to stretch a 4:3 to a 16:10 aspect ratio must be offered.

2.13.11 Perceived image quality

The image displayed in each room shall exhibit clear detail in picture, colour, resolution, contrast and focus, providing a clearly legible presentation at all nominated viewing positions. Focus shall be uniform across the entire image.

2.13.12 Reflected and stray light

The screen shall be free of reflected and stray light when room lighting is set to presentation mode. Where shiny objects or architectural features are located behind a translucent, transparent or otherwise transmissive screen, the screen material and construction shall prevent the transmission of reflected light into the viewing area.

2.13.13 Projector Screens

Dedicated projector screens are optional depending on the physical room layout and wall conditions. The AV Consultant will detail the requirements in the design documentation. The final decision will be based on the application of the size and viewing angles detailed above.

Where a projector screens is supplied it is to be of a motorized type in 16:10 aspect ratio unless UHD/UHD+.

Where a wall is used as a projection surface it is to be plaster board finished to “Level 5 Finish” in accordance with AS/NZS 2589.1:2007 and finished in a flat white paint.

Where whiteboards are used as a projection surface, they are to be supplied with non-reflective surface designed for front projection.

Other surfaces such as glass will be specified/approved on a case by case basis.

2.14 Audio Reproduction/Public Address

2.14.1 Coverage

Each sound system shall provide a sound pressure level in accordance with the installer’s calculated Needed Acoustic Gain (NAG) and be free of discernible distortion, delay, echoes and other artifacts. All audio systems shall provide adequate, even coverage to be clearly audible without acoustic feedback and excess volume at any point. In spaces where wireless microphones are specified, these shall be usable without acoustic feedback at all points in the room. Where specified, design and provide proof of conformance to ANSI/INFOCOMM 1M-2009 “Audio Coverage uniformity in Enclosed Listener Areas”.

Any distributed loudspeaker arrays should have a coverage pattern that is uniform within ± 5 dB over the entire seating area.

Time Alignment may need to be considered in some unique spaces, this will be highlighted in the project specific statement of works.

2.14.2 Gain, Frequency Range and Equalization

Excessive equalisation should be avoided. Audio systems shall reproduce all frequencies within the audible spectrum smoothly. To ensure correct operation after the sound system has been equalised and calibrated, install tamper proof devices over any exposed knobs, switches or other controls on amplifiers and system processing equipment. Ensure that maximum pre-set levels cannot be exceeded to produce distortion or feedback. Provide user interface(s) such that any user may adjust system volume between off (muted) and

preset maximum without exceeding a hard limit 6dB below the point at which feedback will occur. Provide separate control for microphone and source audio, and separate mute buttons for each.

2.14.3 Quality

Digital audio signal paths, the reference level ('zero VU') shall be -20dBFS in any channel. The sound system shall be capable of reaching programmed maximum levels without clipping, distorting or overloading any amplifier or speaker.

2.14.4 Signal Delay

Where appropriate provide any signal delay devices (hardware or in DSP) required to ensure that signal arrival times from different speakers at all points in the rooms are not greater that 20ms.

2.14.5 Hearing Augmentation

The AV Integrator shall provide a hearing augmentation system for all spaces provided with an inbuilt audio amplification system as per the BCA requirements. The type of Hearing Augmentation system shall be determined with due consideration of the type of space, building restrictions, environment, potential interferences and specific user requirements. As a general guideline, all spaces with seating capacity of more than 50 people shall be provided with a hearing induction loop system. All other smaller spaces shall be provided with a 3-pin XLR and a screw lock 2.5mm 12V panel mount jack on a plate to allow for connection of an IR transmitter. The IR Hearing wall plate is to be located adjacent to a front of house Speaker if available, or Co-located with FOH Power point but no higher than 3mts AFFL. If there are no front of house speakers the integrator will require approval of the location.

A DC connector plate is not required at the rack for the 12V IR Plate, a cord mount jack terminated with 500mm spare cable at the PDU location.

The signal type feeding the IR plate is to be Mono Balanced Line Level, the signal -10dB out of the DSP or mixer (50mV – 3V).

The hearing augmentation system must be active at all times, including when the AV system is shut down. Only fixed gooseneck or boundary microphones are to remain active. The Integrator must ensure that all DSPs, amplifiers and other devices required for the hearing augmentation system remain active at all times.

As a minimum, the hearing augmentation system shall comply with:

a) AFILS shall provide greater than 80% coverage within acceptable tolerances

b) IR systems shall provide greater than 95% coverage within acceptable tolerances, with:

c) A minimum of 1 IR receiver for every 25 persons or part thereof shall be provided in each space

d) Induction loop amplifiers and hardware must be Ampetronic, GPT I-Amp or approved equivalent

e) Infra-red modulators, transmitters and receivers shall be Sennheiser or an approved equivalent

f) Coverage is expected to be even across the designated loop / IR coverage area

g) The AFILS shall be commissioned and tested to conform to AS60118-4.

h) The system shall be designed to minimise the effects caused by:

- Electrical and other cabling
- Metal objects, such as ductwork
- Other sources

i) The system shall reproduce source and microphone audio.

j) The system is to remain active and reproduce boundary microphone audio when the AV system is shut down. This is to allow for hearing augmentation when the AV system is not in use.

The AV Integrator must provide a certificate of compliance as per AS1428-2010 for all hearing augmentation systems.

2.14.6 Induction Loop System

Induction loops must be installed in Lecture spaces and Lectorial spaces. Loops may also be installed in rooms with a capacity greater than 50 students. These spaces will be assessed by RMIT on a room-by-room basis and decision criteria must include room use, number and location of adjacent loops.

The AV Integrator must conduct a preliminary survey of the space to ensure that all Standards and Regulation are met and allowed for prior to the final design of the loop. All loop designs must be issued to the principle for approval be it is installed.

Loops must be installed below floor coverings using flat copper tape. If loop cannot be installed due to no floor coverings (e.g. loose laid rugs) or bare concrete floors an alternative solution must be coordinated with RMIT ITS/AV.

Installed Induction loop systems must be installed in an 'ultra low loss phased array' configuration to ensure that audio from one space cannot leak into adjacent spaces.

Hearing augmentation system must provide 80% coverage of the space with low spill to outside areas unless otherwise specified.

As a minimum, the assistive hearing loop must meet the following minimum criteria:

a) Field strength inside the area of use must be equal to 400mA/m plus/minus 3dB (tested with 125ms RMS measurement with 1kHz Sine wave)

b) Total variation in signal across the frequency band 100Hz to 5kHz at 1kHz must be within 3dB anywhere in the loop area

c) Background noise must be less than or equal to -32dB relative to 400mA/m

2.14.7 Infra-Red System

The AV Integrator shall provide a 3-pin XLR wall plate connector for all AV equipped spaces not provided with a hearing induction loop. The connector shall be clearly labeled and located adjacent a GPO. The AV Integrator must also ensure that the audio DSP is configured correctly to provide a mixed feed of source and microphone audio.

The Infra-Red Hearing Augmentation system must include IR transmitters, antennas, IR receiver and room entrance sign. As a minimum, the IR Hearing Augmentation system must meet the following criteria:

a) IR Hearing Augmentation must provide 95% coverage of the room

b) Multiple transmitters may be required to ensure correct operation for all room configurations

c) Transmitters must not be installed outside or in direct sunlight

d) The number of receivers must correspond to the number of people the space accommodates to meet BCA regulations.

e) An induction neck loop option must be provided for each receiver supplied

f) Recharger and rechargeable batteries must be provide for each receiver supplied

g) AV Integrator must conduct a site survey and review line of sight restrictions and ambient light prior to submitting a detail design submission.

2.14.8 Signage

The AV Integrator shall coordinate with the Architect to provide signage indicating the coverage area of the hearing augmentation systems in each area in accordance with AS 1428.2. Where no Architect is appointed, the AV Integrator shall coordinate with RMIT Property Services.

2.15 AV Technologies and Equipment Requirements

2.15.1 HDMI

RMIT has adopted HDMI as the base standard for all digital signals for all installation. All new installations must conform to the current HDMI standard. The following devices as a minimum will be provided with or require a HDMI interface:

a) University PC

b) Laptops

c) Document cameras

d) Blu-ray players

e) Video/data projectors

f) LCD panels

As a minimum standard HDMI 1.4 shall be applied, HDMI devices must comply with the following protocols and standards unless project specific requirements are higher:

a) Hot Plug Detect

b) EDID

c) CEC

d) HDCP

2.15.2 HDCP and EDID

All source devices supplied to the University must support HDCP content and must provide sufficient HDCP keys (KSV - Key Selection Vector) for correct system operation. All video switching equipment must provide KSV caching and/or generate KSV for all displays. The AV Integrator must also ensure that all switching solutions support both EDID and scaling outputs to suit the system design and the resolutions required there in. The AV Integrator must ensure the number of HDCP keys provided will accommodated all displays connected to the system.

The EDID and HDCP function must also be capable of being switched off so that devices (in particular MAC laptops) can be forced to transmit non-encrypted content without HDCP protection.

2.15.3 VGA

VGA connectivity will be offered for legacy laptop support only.

2.15.3 Matrix and Presentation switches

A digital matrix switch shall be used to route the required sources to the relevant destinations in each relevant design classification. The switching device must be capable of accepting both digital and analogue sources, digitising all analog sources to a compliant digital format. All inputs shall be capable of being switched to any output and the resolution scaled depending on the output device requirements. Where required audio should be embedded with the video, however a separate audio switching/processing layer will be required in certain applications.

All AV switches must be HDCP compliant and issue individual KSVs for every display. All KSVs are to be cached to minimize any signal switching delays. AV switches must also allow for editing of the display EDID tables to force display resolutions i.e. 1280:800 for PC display and higher resolutions for Blu-ray/DVD playback (1920:1200HDCP).

Mac devices are common amongst academic staff and have a known issue with maintain HDCP settings for non-protected content. AV switchers must provide the ability to turn HDCP off to force Macs to play non protected content. The AV Integrator is responsible for testing the AV system for Mac devices at commissioning.

2.15.4 Analogue Video

Analogue video types such as CV, S-Video, YUV and formats such as slides, cassette and VHS are no longer supported by RMIT. All existing analogue forms of media must be converted to digital format by the relevant department

2.15.5 Blu-ray

Separate Blu-ray players shall be installed in Lecture spaces and Lectorial spaces with seating capacity for greater than 90 students. Blu-ray players shall also be available in other unique spaces with specific requirements nominated by the Principal. All other spaces will be equipped with a Blu-ray drive installed within the resident PC

2.15.6 Document Camera

HDMI document cameras will only be installed in Lecture spaces and Lectorial spaces with seating capacity for greater than 90 students. HDMI document cameras shall also be available in other unique spaces nominated by the Principal with specific requirements and other unique spaces with particular requirements. All other spaces will be provided with a USB based document camera that will interface to the resident PC

2.15.7 PTZ or Fixed Cameras

Where PTZ or Fixed cameras are install the AV Integrator shall ensure the following:

a) Full unobstructed movement of pan and tilt

b) Zoom and focus are suitable for the final camera position to allow for optimal image quality and content framing

c) The field of view of the camera is not obstructed

d) Camera is to be installed in a location that enables Presentation view and a close up of the lecture position

2.15.8 Connection Plates

AV connection points shall be installed as nominated on drawings. All connection plates shall be engraved and paint filled to indicate the function for each outlet, adhesive labels will not be accepted. The connection plate shall be custom made to suit the décor of the space, typically Clipsal 2000 series plate.

AV connection plate shall typically include the following connectors:

Connection Plate	Connector Type	Label
Laptop Note: Ensure that a data outlet is provided for laptop. Integrator is to co locate Laptop connect plate with Data outlet	HDMI (Type A plug) VGA (F-15 pin connector) Audio (3.5mm stereo audio jack) USB (Type A plug) Only where interactive white boards are installed and USB connectivity to the Laptop is required	LAPTOP HDMI LAPTOP VGA LAPTOP USB
PC	HDMI (Type A plug)	COMPUTER
USB	USB (Type A plug)	USB
Microphone	XLR (female)	MIC
I/R Hearing Augmentation (Wall mount)	XLR (male) Screw lock 2.5mm Power jack	HEARING AUGMENTATION

Where practical, AV connection plates must be collocated with associated power and data outlets.

IF there is no resident PC requested in the design a standard RMIT PC connection must still be installed for every system, location of the PC input plate shall be installed as nominated on drawings.

2.16 Control Systems

RMIT has standardised on the AMX control system to control AV equipment throughout the University. This control system shall allow for push-button keypad and touch panel control for the user as well as the ability to have remote centralised management system (RMS).

The AV Integrator must ensure that all control system processor provided is of AMX manufacture and enabled for AMX RMS. If the control system utilises an IPad as the Touch Panel, the IPad and TP Control's license may be allowed for by the Principle, the integrator must seek clarification at time of tender. The Principle will issue ITunes, SSID & password details for the control system Touch Panel on request. The Touch Panel or Key Pad shall be installed in a location that fulfills the DDA regulations for accessibility. This would generally mean that the interface will be mounted at 1100mm AFFL and not closer than 600mm to a retuning wall. The DDA regulations are revised annually and the document current at the time of installation shall be used.

2.16.1 Graphic User Interface

All RMIT touch panels shall be programmed to incorporate the RMIT standard Graphic User Interface (GUI), including general layout, fonts, graphics and backgrounds. GUI files, shall be provided by the Principle upon request. Any changes to the standard GUI or other forms of customisation must be approved by the Principle.

Technical support pages and interactive help information must be included in all touch panel GUIs. Details for these pages must be approved by the Principal prior to commissioning. Help pages shall also include call for help button that will send a context sensitive email message advising the room number and details of the particular help page been viewed. A selection in the tech pages will allow for this feature to be turned on or off.

All programming source codes, including GUI files will be the property of RMIT, and must be provided to the Principal at practical completion.

For further information regarding GUI layouts and functionality, refer to the RMIT AMX Design Guideline document.

2.16.2 Keypad Layout

AV systems provided with a push-button keypad control system shall comply with the RMIT AMX Guidelines. Any variation to the layout must be approved by the Principal.

All programming source codes will be the property of RMIT, and must be provided to the Principal at practical completion in both compiled and un-compiled formats.

2.16.3 Remote Management

See RMIT AMX Design Guidelines for further information

2.16.4 Web Access

All control systems must be enabled for remote web access via the AMX RMS or VNC.

2.17 Miscellaneous Technical Details

2.17.1 Operating Environment

Materials and equipment shall be capable of operating satisfactorily and as specified under the following ambient conditions:

a) Temperature range: 0^{o}C to 40^{o}C

b) Humidity: up to 95%

c) Altitude: 100m

2.17.2 Mounting and locations of equipment

Locations of AV equipment shown on AV drawings are indicative only. Installation of all equipment must be coordinated with Architect's detail drawings.

Where no Architect is appointed, the AV Consultant will provide a set of AV layout plans and elevations as required.

The AV Integrator must allow for movement of equipment by up to 2m without additional cost.

2.17.3 Adjust and clean

Remove debris from installation in concealed spaces. Align equipment vertically or horizontally as applicable, and where practical, with ceiling and room features. Locate equipment symmetrically where appropriate in relation to other features including air grilles, ceiling tiles and beams. Where possible liaise with other trades and align with other services in close proximity. It is the AV Integrator's responsibility to liaise with other services and the coordination of the alignment of services and accessories in close proximity.

At final handover the equipment shall be clean of any debris or marks left from the install process.

2.17.4 System hum and interference

There shall be no visible noise or audible hum or interference in the AV systems. Where such interference arises, it shall be removed by the AV Integrator.

2.18 Environmental Effects on Audio Visual

2.18.1 Lighting

A number of the RMIT AVS designs contain the capability for Lecture Capture and Video Conferencing. These spaces need special consideration given to the overall impact of both natural and artificial light on the quality of the imagery being captured. The rooms standard lighting design may need to be adjusted to suit the intended capture area or have additional specialised lighting included.

The room may also need to have the natural lighting controlled via blinds. The preferred install would have motorised blinds that can be controlled via the rooms AV system. When a room function that involves cameras is selected the lights would call up the preconfigured scene.

The needs of each space should be considered on a case-by-case basis to ensure the user experience and functionality is kept at a high standard.

2.18.2 Audio

Consideration should given to wall and floor treatments when an audio visual system is installed to ensure a high level of quality is achieved. The DSP configuration may not be enough to make some spaces acceptable for voice reinforcement and speech Intelligibility.

The needs of each space should be considered on a case-by-case basis to ensure the user experience and functionality is kept at a high standard.

3 Deliverables

3.1 AS BUILT DOCUMENTATION

3.1.1 Package

One copy of the operational and maintenance manuals shall be provided at practical completion. Deliverable documentation shall be submitted in digital format on DVD, USB or by a FTP site. It must include a main directory folder named based on location, e.g. 12.03.19 would refer to: Building 12, level 3, room 19. Sub directory folders must be named as indicated in the table below.

Documents shall be provided in native editable formats such as Word, Auto CAD, Visio as well as in a un-editable PDF format. Software and configuration files shall be provided in complied and editable format in the native format specified by the manufacturer (AMX source code, DSP configurations etc). The document package shall include, but not be limited to:

Ref	Item	Description
01	Equipment Schedule	Equipment Schedule (In standard formation – RMIT will provide template) – Live Document
02	Source Codes	AMX Source code including modules – property modules may be locked. All source code to be uncompiled and in an editable format. A copy of the final installed compiled code to be included in addition to the uncompiled source code.
03	Equipment Configuration	Equipment configuration data – where any tech settings are configured differently from the default settings then these need to be provided to RMIT either as a file, table, screen dumps etc
04	Equipment Firmware	Current copy of equipment firmware if custom or a specific version is required and the reason.
05	As-Builts	As-builts must include the following: ▪ As built schematics ▪ As built cable schedules ▪ As built AV layout plans showing equipment locations and cable runs ▪ As built rack layouts ▪ As built custom components, connection plates and patch bays ▪ Certifications such as hearing loop certificate ▪ Austel Certification including formal test results of the CATX cabling in PDF format. i.e. a Fluke DTX or equivalent type tester. ▪ Test and Tag schedule
06	O&M Manuals	Operation and Maintenance Manuals Documentation – servicing, maintenance intervals, operation, system description and any training documentation produced.
07	Quick Reference Guide	Quick reference guide (In native format – RMIT will provide template)
08	Manufacturer Manuals	All manuals for non-standard RMIT equipment only, warrantee cards and documents,

09	Design Development Documents	• RMIT Specification or Scope of works. • Approved shop/system design drawings. • Any RFI,SI,or CI that results to a change to the original design.

All remotes, adaptors and spares must be supplied in a sealed box with room and number etc to RMIT AV at PC.

3.1.2 Equipment Schedule

The RMIT equipment schedule template will be provided by the Principal at the commencement of the project. The AV integrator shall populate a copy of the equipment schedule and upload it to the nominated RMIT cloud based directory.

The equipment schedule shall be completed in the nominated format and made accessible to RMIT ITS staff such that they are able provide IP address etc. The document must remain a live document, and updated as changes occur, during the course of the project. The schedule will contain item description, location, network information, lock out details, firmware and order reference. The order reference is only required for items that have a manufacturers warranty greater than the defects and liability period, to allow RMIT to negotiate a warranty claim after 12 months. The order reference must contain the AMX invoice number for all AMX equipment to allow for RMIT to claim EAP point.

The completed schedule must be submitted with final as built documentation at practical completion.

3.1.3 Quick Reference Guide

Quick reference guide shall be two pages maximum and in the correct format as nominated by the Principal. The QRG shall be printed double sided, laminated and displayed near the main control interface.

As a minimum the Quick Reference Guide shall include the following information:

a) Picture of system user interface

b) Examples of selection and use of system sources and destinations

c) Reference to RMIT Helpdesk contact details and/or online training resources

d) RMIT branded with no reference to the AV integrator.

The principle will prove a quick reference guide template and samples.

3.2 Training

RMIT will advise if training is required, if no advice is given then the AV integrator is to provide training as an option price as part of their submission.

Contractors shall allow for a minimum of 2 training sessions for each teaching space. An operator training course and a technical training course shall be provided.

The operator-training course shall include but not be limited to training of the following systems:

a) Basic operator principles of the system

b) Operating principles of video, audio and control system equipment and functions

c) Practical training in the operation of each function of the control system

d) Equipment locations and operation

The technical training course shall include, but not be limited to, training of the following systems:

e) Overall principles of operation of the AV System with specific emphasis on the installed system

f) Basic operator principles of the system

g) Operating principles of video, audio and control system equipment

h) Practical training in the operation of each function of the control system

i) Equipment locations and operation

j) Maintenance and fault finding procedures

k) Fault simulation for practical training in fault finding procedures

Each training session must be a minimum 2 hours (Contractor to nominate training time depending on system functionality and complexity) and include at least 6 participants. Training is to be formally structured. A training program, syllabus and personnel assessment format shall be provided prior to commissioning for approval. Training shall be provided prior to the issue of final certificate of the works.

Additional training courses may be requested by RMIT. All training documentation produced shall be included in electronic copy as part of project deliverables

3.3 DEVICE ACCESSORIES

All accessories included with equipment purchases but not installed or used, such as handheld remote controls, adaptors and leads, shall be handed over to the Principal in a box or appropriate container clearly labeled with the project title and location.

3.4 FIRMWARE

All AV devices shall be provided with current versions of firmware or applicable software. It is the Integrators responsibility to obtain and load any firmware/software on site to devices found not to be current at the date of handover to RMIT.

A copy of the loaded firmware must be provided on the DVD with the final as-built documentation.

3.5 VARIATIONS AND NON-COMPLIANT ITEMS

Any project variations or non-compliant devices must be approved by the Principal and clearly documented in the final submissions.

3.6 DECOMMISSIONING

A majority of AV works undertaken at RMIT are system upgrades. As part of this process the existing system must be decommissioned and all equipment returned. All cables and support infrastructure shall be removed and disposed of responsibly.

All Asset, Serial, Part and product details for decommissioned equipment must be recorded by the AV Integrator and supplied as a part of the Deliverable documentation. Appendix J contains the Asset Disposal Authorisation document.

The AV Integrator must include all associated decommission cost as part of their submission unless advised by the Principle.

3.7 RMIT IT NETWORK

3.7.1 TCP/IP Addressing

At the commencement of the project, the AV Integrator must populate the Equipment Schedule (live document) with details of all the devices that require an assigned TCP/IP address. As a minimum the AV Integrator must provide the device make, model, location (room number), MAC address and outlet number. The Principal / RMIT ITS will then populate the IP address, subnet and gateway details.

The IP addresses of all AV equipment must be assigned dynamically if supported by the device. The RMIT DNS server will allocate a fixed TCP/IP address based on the devices MAC address. RMIT ITS will issued these address as part of the construction process via the equipment spread sheet. RMIT require this spread sheet to be populated with MAC address, port numbers and item name before an TCP/IP address can be issued.

Final settings and configurations shall be included with the Deliverable documentation.

3.7.2 Network Services

The following services are available on the RMIT network

Service	Description	Name	Address
DNS	Domain name lookup server	ns1-internal.rmit,edu,au ns2-internal.rmit,edu,au	10.68.196.1 10.84.196.1
NTP	Network time server	time1.rmit.edu.au	N/A
RMS Server	Remote Management Server	rms.rmit.edu.au	131.170.93.4 TCP/IP address for testing only

DNS name to be used for all services, the IP addresses are shown for reference only and should not be entered into any device.

All RMIT AV Ethernet traffic is contained in a VLAN. The AV VLANS are configured on a geographical basis.

3.7.3 Network Device Naming Convention

Any Network AV devices capable of been named must use the following format.

Bwwwxxyyy(a)-eeezz – note that names are deliberately chosen to have a maximum of 15 characters.

Where: specialist

B	Constant Character (B=MEL, S=Saigon South, H=Hanoi)
www	Building, 3 digits, required
xx	Level, 2 digits, required
yyy	Room, 3 digits, required
a	Room ID, 1 char, optional based on Property Services Room ID
-	Delimiter

e Device extension; see below for allowed values
FPD = Flat Panel Display
PRJ = Projector
LCC = Lecture Capture Camera
LCA = Lecture Capture Appliance
AXC = AMX Controller
AXP = Touch Panel
WXP = Wireless Touch Panel
DMM = Digital Media Matrix (Creston, Extron, AMX)
DMR = Digital Media Receiver (Creston, Extron, AMX Receiver)
WMC = Wireless Media Controller (Wireless Media Controller)
AMP = Mixer Amplifier
MIC = Wireless Microphone
VCC = Video Conferencing Codec
DSP = Digital Sound Processor
PCI = Lighting interface
MPS = Motorised Projection Surface
PDU = Power Distribution Unit
PIR = Motion Sensor
MOC = Blind Motor Controller

z Device number, 2 digits, required

Device type	Example name	Notes
Flat Panel Display	Bwwwxxyyy-FPD01	01 stands for first display on left hand side as you enter a room through its main door. All others are sequentially numbered clockwise from the first.
Projector	Bwwwxxyyy-PRJ01	01 stands for first projector as you enter a room through its main door. All others are sequentially numbered clockwise from the first.
Lecture Capture Camera	Bwwwxxyyy-LCC01	01 stands for first camera as you enter a room through its main door. All others are sequentially numbered clockwise from the first.
Lecture Capture Appliance	Bwwwxxyyy-LCA01	01 stands for first lecture capture appliance as you enter a room through its main door. All others are sequentially numbered clockwise from the first.
AMX Controller	Bwwwxxyyy-AXC01	
Control Touch Panel	Bwwwxxyyy-AXP01	
Digital Media Matrix (Creston Controller)	Bwwwxxyyy-DMM01	
Digital Media Receiver (Creston Fibre Receiver)	Bwwwxxyyy-DMR01	01 stands for first digital media receiver as you enter a room through its main door. All others are sequentially numbered clockwise from the first.
Wireless Media Controller (Creston Wireless Media Controller)	Bwwwxxyyy-WMC01	
Mixer Amplifier	Bwwwxxyyy-AMP01	
Wireless Microphone	Bwwwxxyyy-MIC01	

3.7.4 IT Data Switches & Cabling

IT data network switches must not be installed by the AV Integrator. All IT network connectivity will be provided by RMIT ITS. Local AV network switches must not be used. Connectivity for AV systems must be via provided

data outlet. The AV Integrator shall provide necessary patch cables which meet the applicable RMIT IT cabling standard (See Section 10.4 of RMIT Design Standards – Section 10 Communications)[2]. When defining system design all documentation will clearly show TCP/IP Network requirements in order to ensure network points and addressing are provisioned as part of the project.

3.7.5 Commissioning AV/IT Integration

When commissioning AV systems the AV Integrator may provide a temporary IT data switch for testing purposes only. This switch MUST NOT be connected to an RMIT network termination point (switch, wall point, patch panel etc.), and can only occur prior to practical completion of a new building project. If connection to the RMIT network is required to complete the commissioning, this will be coordinated with the Project Manager and an RMTI ITS representative after TCP/IP addresses and network details have been issued and configured on the relevant devices.

3.8 HANDOVER

Integrated AV works will not be considered complete until the “Handover Approval Form (see appendix I) has been signed by both the AV Integrator and the Principal. The Handover Approval Form can only be completed after the Consultants Test Script (CTS) has been submitted and accepted. The CTS is an electronic document completed by the consultant during system certification, it is supporting document to the standard and is available on request

Note: Handover will not be granted until all installation defects, identified during the commissioning phase, have been rectified or a rectification plan has been submitted and accepted by RMIT.

3.9 DEFECTS LIABILITY

The AV Integrator must provide a twelve (12) month defects liability for the scope of works and any variations to the scope of works. The defects liability period must commence from the date of practical completion.

The AV Integrator shall be responsible for the repair or replacement of any equipment, cabling, terminations or systems that fail to operate in accordance with the manufacturer's specifications or rectification of defective works, where faulty equipment or defective cabling or components result in the system being unavailable for its specified use. If RMIT needs to replace a faulty product to ensure room availability is maintained, the effected system’s Defect Liability period shall be honoured by the original integrator. RMIT will ensure that a competently trained person performs the work. All equipment replaced as part of defects liability must have the full manufacturer’s warranty.

[2] Note: Cabling standards for type and signal characteristics are to be observed. Communications cabling installation practices (e.g. cabling topologies) can differ from AV requirements.

4 SPECIFICATIONS

4.1 ROOM CLASSIFICATION

In order to maintain a level of consistency for end users as well as maintenance staff, a University wide design strategy has been developed to establish a set of standard formats for teaching spaces and the associated AV facilities. Venues with AV devices will be classified as one of the following formats as described in the table below. Specialist and other spaces may fall outside of the standards covered in this document. In these instances, a bespoke design will be completed to provide the required functionality. These bespoke designs, where possible, will be derived from the standards and preferred equipment lists detailed in this document.

The new designs incorporate the current digital AV technologies such as HDMI, wide screen projection (16:10) and higher resolutions (WXGA1280:800 & WUXGA1920:1080). To allow for greater flexibility within a general teaching space devices such as Bluray players and document cameras are now peripheral based and are connected to the AV system via the resident PC. i.e. USB for document cameras and in the case of the Bluray provided with the resident PC. Larger spaces such as lecture theatres will still utailse standalone devices.

The new designs are a total digital solution and provide legacy support for VGA connectivity. No direct support is provided for older analogue signals such as Composite (CV), Component (YP_BP_R, YUV, RGB), S-Video etc. These signals will be "scan converted" to digital prior to connection to the AV system. In the short term portable scan converters are available by contacting the AV department via the service desk.

Room functionality from the previous AV standards has been maintained or increased due to peripheral based devices and adoption of HDMI. This allows the designs to be aligned to the size of the room. The standards also include designs for use in meeting and office spaces where there is less demand on the AV system and accessories such as remote controls are easily secured. This means that Pro-domestic LCD panels can be installed and generic remotes used as the control systems. The new standards are not a one-for-one replacement of the old and the following table shows the correlation between the two.

New	AV00-20I (interactive)	AV00-20P (Projector)	AV00-20L (LCD)	AV20-70	AV50-120	AV90-360	AVCollab	AVVC
Old	N/A	N/A	AV1 & 2	AV2 & 3	AV3 & 4	AV5	AVC	N/A

We note that these categories are by no means all-encompassing, as there are some AV facilities that fall outside these classifications. The classifications are as follows:

AV00-20I (interactive) **AV00-20P (Projector)** **AV00-20L (LCD Display)** **< 20 Students**	The simplest of the AV enriched space, designed for small meeting space and includes: – A large format LCD panel, projector or interactive whiteboard as the primary display device. The projection and interactive whiteboard system will include surface mounted front of house speakers to reinforce audio, the LCD panel will utilise integrated speakers. – There will be provision to connect a resident University PC and Laptops (VGA and HDMI). – Bluray/DVD playback will be via the resident PC – A USB document camera may be provided if a resident PC is installed – Control for the room's AV equipment including source selection and audio levels will be controlled by a wall mounted eight-button keypad controller. The keypad controller shall be typically installed on the wall adjacent the display

	device depending on space available. In private meeting rooms and office spaces the standard infrared remote control may be used. – Control system shall be enabled for remote management and support via the University RMS. – There will also be provision to connect an IR based hearing augmentation system.
AV20-70 **20 – 70 Students**	AV20-70 type teaching space or Lab with 20 – 70 students. Speech reinforcement is included for spaces above 50 students lab spaces where student interaction is expected. Dual projection is an option to accommodate unusual shaped room shapes or furniture: – Optional dual projection system to accommodate unusual shaped rooms or furniture arrangements where not all students face the front. Dual projection will display parallel content only. – The projection surface can be onto a suitable wall (preferred) or motorized screens. – Surface mounted front of house speakers to reinforce source audio. – There will also be provision to connect a IR based hearing augmentation system to provide a mix of source and microphone audio. For spaces with seating capacity larger than 90 people, a hearing induction loop will be installed. – A wired boundary microphone will be provided at the teacher's lectern or teaching position. A wireless lapel microphone will also be provided. Optional for rooms with 50 or more students or noisy environments. – Resident University PC and Laptop (VGA and HDMI). – USB document camera will be connected via the resident PC – Lecture capture is an option for these spaces. The University lecture capture system will be provided to record lectures. A dedicate PTZ camera will also be provided to capture the Presentation view and Lectern position. A PIR installed on the lectern will be used to auto switch between the two presets. – Bluray/DVD playback will be via the resident PC – Control of the room's AV equipment including source selection and audio levels will be controlled by the touch screen controller. The controller will be installed on the wall or teacher's lectern, depending on requirements of the teaching space. – Control system shall be enabled for remote management and support via the University RMS. – Control system shall have provisions to be integrated with room lighting, motorised blinds and EWIS as necessary – Spaces with greater capacity that 90 students will also include a LCD panel at the entrance to display room booking information via the University's scheduling/signage.
AV50-120	AV50-120 type AV systems are designed for small lecture theatres and large tutorial rooms. The AV system includes:

50 – 120 Students	– A dedicated projection system, projecting onto a suitable wall (preferred) or motorized projection screen. – Selected spaces shall be provided with a second projection system with the ability to display parallel content to allow for greater viewing angles. – Resident University PC and Laptop (VGA and HDMI). – Dedicated Document camera will be provided – Dedicated Bluray player for Bluray/DVD playback – Surface mounted front of house speakers to reinforce source audio. – Ceiling mounted speakers to reinforce microphone audio – Hearing induction loop which will be installed to reinforce a combination of source and microphone audio. – A wired boundary microphone will be provided at the teacher's lectern or teaching position. A wireless lapel microphone and wireless handheld microphones will also be provided – Lecture capture is an option for these spaces. The University lecture capture system will be provided to record lectures. A dedicate PTZ camera will also be provided to capture the Presentation view and Lectern position. A PIR installed on the lectern will be used to auto switch between the two presets. – Control of the room's AV equipment including source selection and audio levels will be controlled by the touch screen controller. The controller will be installed on the wall or teacher's lectern, depending on requirements of the teaching space. – Control system shall have provisions to be integrated with room lighting, motorised blinds and EWIS as necessary – Control system shall be enabled for remote management and support via the University RMS. – Spaces with greater capacity that 90 students will also include a LCD panel at the entrance to display room booking information via the University's scheduling/signage.
AV90-360 **90 – 360 Students**	AV90-360 type AV systems are designed for medium and large lecture theatres. The AV system forms the basis of complex and includes: – A dedicated projection system, projecting onto a suitable wall (preferred) or a motorized projection screen. – Selected spaces shall be provided with a second projection system with the ability to display parallel content to allow for greater viewing angles. In specialist spaces this second projection system may be used to display separate content in the case of Video Conferencing. – Resident University PC and Laptop (VGA and HDMI). – Dedicated Document camera will be provided – Dedicated Bluray player for Bluray/DVD playback

	– Dedicated Video Conferencing Codec – Lecture capture is an option for these spaces. The University lecture capture system will be provided to record lectures. A dedicate PTZ camera will also be provided to capture the Presentation view and Lectern position. A PIR installed on the lectern will be used to auto switch between the two presets. – Surface mounted front of house speakers to reinforce source audio. – Ceiling mounted speakers to reinforce microphone audio – Hearing induction loop will be installed to reinforce a combination of source and microphone audio. – A wired boundary microphone will be provided at the teacher's lectern. A wireless lapel microphone and wireless handheld microphones will also be provided – Lecture capture is an option for these spaces. The University Echo360 lecture capture system will be provided to record lectures. A dedicate PTZ camera will also be provided to capture the room view – Control of the room's AV equipment including source selection and audio levels will be controlled by the touch screen controller. The controller will be installed on the wall or teacher's lectern, depending on requirements of the teaching space. – Control system shall have provisions to be integrated with room lighting, motorised blinds and EWIS as necessary – Control system shall be enabled for remote management and support via the University RMS. – Spaces with greater capacity that 90 students will also include a LCD panel at the entrance to display room booking information via the University's scheduling/signage.
AVCollab **< 48 Students**	AVCollab space AV systems are designed for collaborative type learning. The AV system includes: – Up to 8 flat panel displays capable of displaying content from local embedded PCs on the flat panel or from the teacher's sources. – Resident University PC and Laptop (VGA and HDMI). – Dedicated Document camera will be provided – Bluray/DVD playback will be via the resident PC – A wired boundary microphone will be provided at the teacher's lectern or teaching position. A wireless lapel microphone will also be provided – Ceiling mounted speakers to reinforce teacher's microphone audio – Panel mounted speakers for source audio and embedded PC audio – There will also be provision to connect a IR based hearing augmentation system to provide a mix of source and microphone audio. For spaces with seating capacity larger than 90 people, a hearing induction loop will be

	installed. – Control of the room's AV equipment including source selection and audio levels will be controlled by the touch screen controller. The controller will be installed on the wall or teacher's lectern, depending on requirements of the teaching space. – Control system shall have provisions to be integrated with room lighting, motorised blinds and EWIS as necessary – Control system shall be enabled for remote management and support via the University RMS. – Spaces with greater capacity that 90 students will also include a LCD panel at the entrance to display room booking information via the University's scheduling/signage.
AVVC	AVVC space AV systems are designed for a wide rang of seat numbers in Video Conferencing type rooms. The AV system includes: – Resident University PC and Laptop (VGA and HDMI). – Bluray/DVD playback will be via the resident PC – Provision for a wireless presentation receiver – A wired boundary microphone will be provided on the table/joinery. A wireless lapel microphone will also be provided – Ceiling mounted speakers to augment far end voice. – Wall mounted speakers for source audio and embedded PC audio. – There will also be provision to connect an IR based hearing augmentation system to provide a mix of source and microphone audio. – Wall mounted LCD/LED panel or projectors, single and dual screen configuration – Video bridge to feed the room pc USB video and audio for Web VC – Control of the room's AV equipment including source selection and audio levels will be controlled by the touch screen controller. The Touch panel controller will be located as per individual room briefs. – Control system shall have provisions to be integrated with room lighting, and motorised blinds as necessary – Control system shall be enabled for remote management and support via the University RMS.

Note these definitions are used where specified in a classification. They also compliment the General Principles in all AV designs and provide specific detail about the functionality provided for the user in each of the room types.

A summary of the system classifications as well as the system schematic drawings of these classifications are contained in Appendix A-G.

4.2 Design Building Blocks

The Audio Visual systems in RMIT have been designed with specific requirements to suit the many facets of our business. The standard designs should be suitable for the majority of the spaces but in the event that changes need to be made the table below in conjunction with the Building Blocks schematic can be used to adapt or enhance a Standard system. The design adaptations are available to be added to a system to ensure the governing standards are reflected while maintaining equipment from our supportable list.

Where a custom design is required, it will be developed to meet the technical requirements of the AV standards, user requirements and the anticipated life cycle of the room. Where possible equipment shall be from the Approved Equipment List or current vendors. Custom designs must be approved by RMIT AV prior to implementation.

RMIT UNIVERSITY	AV0-20I	AV0-20P	AV0-20L	AV20-70	AV50-120	AV90-360	AV Collab	AV VC Meeting
Lecture Capture	N/A	N/A	N/A	Yes	Existing	Existing	N/A	N/A
AV 20-70 IWB	Existing	N/A	N/A	Yes	N/A	N/A	N/A	N/A
USB Connectivity	Existing	N/A	N/A	Yes	Existing	Existing	Existing	Yes
Multi Screen (>2)	NA	N/A	N/A	Yes	Yes	Yes	Existing	N/A

4.3 Video Conferencing

The Video Conferencing Codec will be supplied by RMIT. The integrator shall be responsible for the installation and commissioning and integration with the Audio Visual system including test calls and, correct inputs and signal levels. If project specific drawings are not supplied the RMIT ITS-AVS drawings shall be used as a reference for connections,

The integrator is responsible for requesting the Codec from the RMIT ITS-AVS Project Manager in a timely fashion to complete the works in accordance with the project timelines.

There are a number of settings the Integrator will need to request to ensure a working system is delivered, some may be project specific but in general all codecs will be set up to the same standard.

Video Conferencing Codec settings	TMS Server	131.170.3.231
	Gatekeeper	131.170.3.230
	Boarder Controller	131.170.21.125
	NPP	Standard
	Multipoint	If Requested
	Dual Screen	If Required
	SIP	Enabled

	Call Limit	2M
	Warranty	3 years on purchase
	E164 Alias	On Request
	Password	On Request
	Auto Answer	On
	H323	Enabled
	PIP	Enabled
	OSD	Disabled

4.4 Computer/iPad

An RMIT resident PCs will be supplied by ITS where required. The AV Integrators are responsible for the installation and liaising with RMIT for the video configuration of the resident PC. To simplify coordination, RMIT ITS will image the resident PC.

The resident PC will include Dual head HDMI/DVI compatible video cards (Display port to HDMI adaptors will be provided by RMIT if required) and installed Blu-ray drive. Note the local monitor connection may be DVI.

Where requested, connectivity for an iPad will be via the digital iPad interface adaptor (HDMI), which should be connected via the resident PC HDMI cable. The adaptor will be permanently connected to this cable with a heat shrink cover to prevent removal of the adaptor.

4.5 Lecture Capture

Currently RMIT uses the Echo360 system for capturing lectures. Audio, video (copy of the projected image) and a PTZ Camera input can be captured in a single session. When a booking is made for a specific room and time the capture device encodes audio, video and camera and delivers it to a centralised server system for student access. Note: Camera selection is optional at time of booking.

The Echo360 device shall be supplied by RMIT. It is the AV Integrators responsibility to install and integrate the Echo360 with the required system for audio and video recording. Network cabling shall be directly connected between the device and the RMIT telecommunications outlet (i.e. no intermediate network switch) and the Echo360. Network cabling must comply with the RMIT IT standards for communication cabling for installation and termination (See Section 10.4 of RMIT Design Standards – Section 10 Communications [4]).

4.6 Digital Signage

Currently RMIT uses the NEC Live system for Digital Signage. The system can either by installed as a Player mounted behind a panel or software installed on to a PC. The integrator shall supply a license if required.

In general the center of the signage panel shall be 1400mm AFFL for all signage panels in either Landscape or Portrait orientation. In all cases the integrator shall confirm location, height and orientation prior to installation. Where a player is installed behind a panel, the unit shall be obscured from view and be securely mounted to stop unauthorised removal. The panel or player may need additional security measures installed, this will be documented in the RFP/RFT.

Special consideration shall be paid to the viewing angles to ensure the content is clearly displayed. The location of the panel shall not be obscured by physical or environmental factors of the installation. The panel location shall a positioned such that it can be easily maintained and accessible for servicing and client interaction.

As a part of the design power and data requirements shall be allowed for control and network connection of all items installed.

4.7 Glossary, acronyms and abbreviations

720p HDTV	Video mode characterised by a progressive scan signal with a resolution of 1280x720 pixels
1080i HDTV	Video mode defined by ITU-R recommendation BT.709-5; characterised by a 2:1 interlaced signal with an active area of 1920x1080 pixels
1080p HDTV	Video mode characterised by a progressive scan signal with a resolution of 1920x1080 pixels
AFFL	Above finished floor level
AV	Audio Visual
BCA	Building Code of Australia
BMS	Computer-based Building Management System
CATx	Category cabling
CCTV	Closed Circuit Television, whether analogue or TCP/IP based
CD	Compact Disc – the common optical disc format for recorded audio and data.
CV (or CVBS)	Video signal suitable for transmission over a signal cable and containing all components of the PAL/NTSC signal (Colour, Video, Blanking, Syncs)
dB	Decibel, a unit quantifying one signal with respect to a reference. Specifically: dBm references 1mW600OHM dBu references 775mV rms (from 0dBm = 0.775V into 600□) dBFS references 'full scale' in a digital signal path
Dual link	A DVI/SDI standard providing video signals at higher resolutions
DVD	Digital Versatile Disc / Digital Video Disc – the common optical disc format for recorded video, audio and data
DVI	Digital Visual Interface – a digital component video signal common in personal computers and workstations.
DVI-D	DVI-Digital – A DVI interface or connector providing only digital signals
DVI-I	DVI-Integrated – A DVI interface providing both digital and analog RGB signals
EWIS	Emergency Warning and Intercommunication System
FPD	Generic abbreviation for flat panel displays (LCD, Plasma, OLED etc)
FFL	Finished Floor Level (Above FFL)
FCP	Fire Control Panel
FIP	Fire Indication Panel
GPO	General Purpose Outlet – Australian standard 240V, 3-pin format
HD	High Definition – commonly applied to signals at a higher resolution than SD
HD	Hard Disk
HDCP	High-bandwidth Digital Copy Protection – a system of preventing the copying of high definition video. All components in the signal chain must support HDCP.
HDMI	High Definition Multimedia Interface – a digital component video signal which provides uncompressed digital video and up to 8 channels of audio
HDSDI	High Definition Serial Digital (video) Interface – broadcast standard for the transport of uncompressed high definition video at bitrates up to 1.485Gb/s
HDTV	High definition television – video transport at higher quality than Standard Definition. For Australian TV – 1080i; for DVD or other may be 1080p
IP	Ingress Protection (eg: IP65)

IP	Intellectual Property
ITU	International Telecommunications Union, a technical standards organisation
ITU-T	Telecommunications Standardisation sector of the ITU
KVM	Keyboard/Video/Mouse
LCD	Liquid Crystal Display
Lumen (lm)	Measure of luminous flux. All references in this document shall be read as ANSI Lumens
MATV	Master Antenna Television – reticulation of free-to-air and subscription television services over a common channel (analog/digital via coaxial or digital via TCP/IP)
MECP	Master Emergency Control Panel
PA	Public Address
PC	Personal Computer
PTZ	Describes a subset of video cameras with motorised Pan, Tilt and Zoom
Rx	Receiver
SDTV	Standard definition video signal – in Australia 576i
SDI	Serial Digital (video) Interface – broadcast standard for the transport of uncompressed video; for Australia (576i) at a bitrate of 270Mb/s
Single Link	A DVI/SDI standard providing video signals at high resolutions
SNR	Signal-to-noise ratio of analog systems
STB	Set Top Box – device used to receive cable TV or digital terrestrial TV for display on an analog TV or monitor
STP	Shielded Twisted Pair cabling
TCP/IP	Transmission Control Protocol / Internet Protocol
TP	Twisted Pair cabling
Tx	Transmitter
VCR/VTR/VR	Videocassette/Videotape recorder
VGA	Video Graphics Array –progressive scan signal at 640x480 pixels.
WXGA	Wide XGA signal (for this document denotes 1280x800 pixels resolution)
WUXGA	Wide high-resolution XGA signal (for this document denotes 1920x1200 pixels resolution)
XGA	Extended Graphics Array, 1024x768 pixels
UXGA	High-resolution XGA , 1600x1200 pixels
VCT/VTC	Videoconference / Video Teleconference (interchangeable)
VoIP	Voice/Video over TCP/IP
YC, Y/C	Separated Video (also S-Video) – video signal characterised by Luminance (Y) and Chrominance (C) signals on separate cables
YCbCr/YPbPr/YUV	Component Video signal

A. AV Categories Summary

RMIT UNIVERSITY

AV Classifications

	AV00-20I (IWB)	AV00-20P (Projector)	AV00-20L (LCD)	AV20-70	AV50-120	AV90-360	AVCollab	AV VC Meeting
Interactive Whiteboard	✓							
Projection		✓		✓	✓	✓		✓
Dual Projection					O	O		O
Parrallel Projection				O	O	O		O
Projection Screen		O		O	O	O		O
LCD Panel			✓				✓	O
Preview Monitor					✓	✓		
Resident PC	✓	C	C	✓	✓	✓	✓	✓
HDMI Laptop Connection	✓	✓	✓	✓	✓	✓	✓	✓
VGA Laptop Connection	✓	✓	✓	✓	✓	✓	✓	✓
USB Document Camera	C	C	C	C			C	C
Document Camera					✓	✓	✓	
Blu-ray player (Installed in PC)	✓	✓	✓	✓			✓	✓
Blu-ray Player					✓	✓		✓
PTZ Camera				O	O	✓		✓
Echo360 Lecture Capture				O	O	✓		
Video Conference Codec						O		✓
Lectern Microphone				✓	✓	✓	✓	✓
Wireless Lapel Microphone				O	✓	✓	✓	O
Wireless Hand-held Microphone					O	✓	O	
Front of House Speakers	✓	✓		✓	✓	✓		✓
Ceiling Speakers				O	✓	✓	✓	✓
IR Hearing Augmentation	I#	I#	I#	I	O	O	I#	O
Hearing Induction Loop					✓	✓	✓	O
Push Button Control System	✓#	✓#	✓#					
Touch Panel Control System				✓	✓	✓	✓	✓
RMS	✓	✓	✓	✓	✓	✓	✓	✓
Lighting Integration				C	✓	✓	C	✓
Motorised Blind Integration				C	C	C	C	C
EWIS Integration				C	C	C	C	C
Previous AV standard names	AV1/2			AV2/3	AV3/4	AV5	AVC	N/A

C – Denotes capable (no additional infrastructure required)

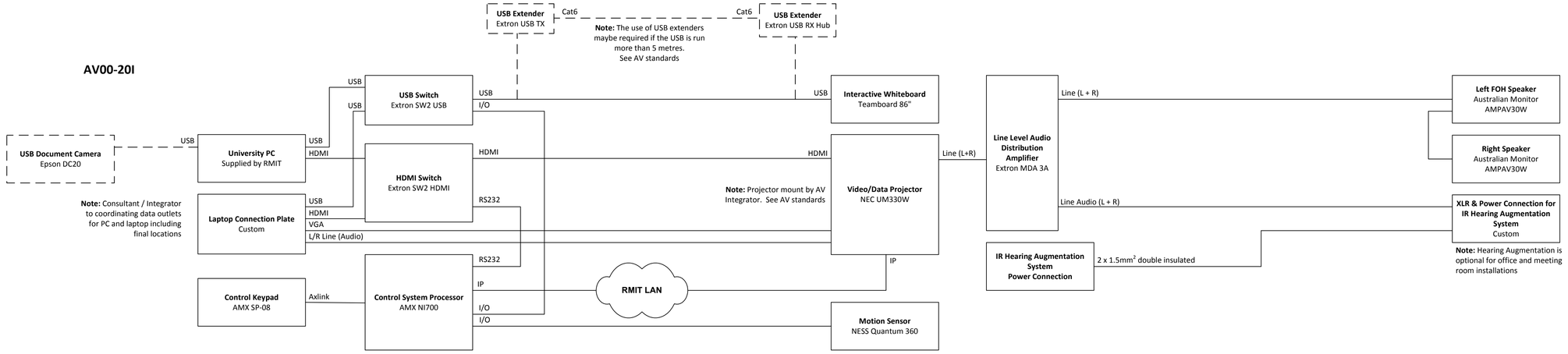
O – Optional (additional infrastructure required)

I – Infrastructure only. I/R Transmitter to be installed as required

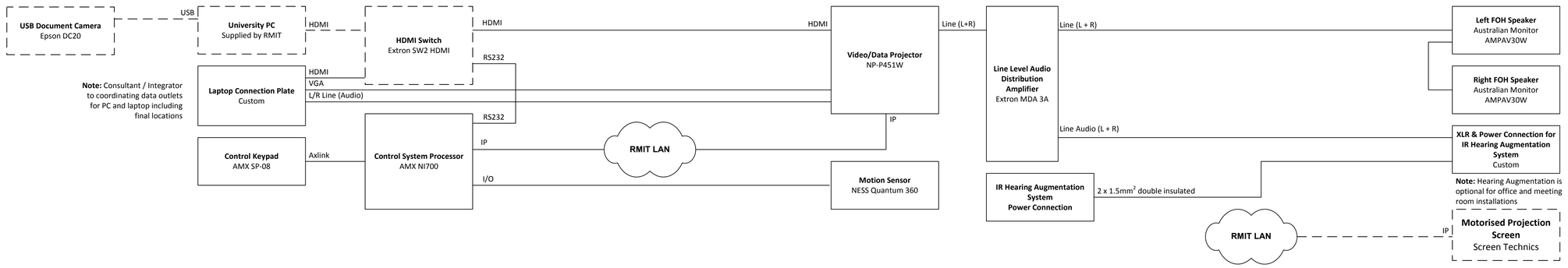
– Optional in office and private meeting rooms only

B. AV00-20 Schematics

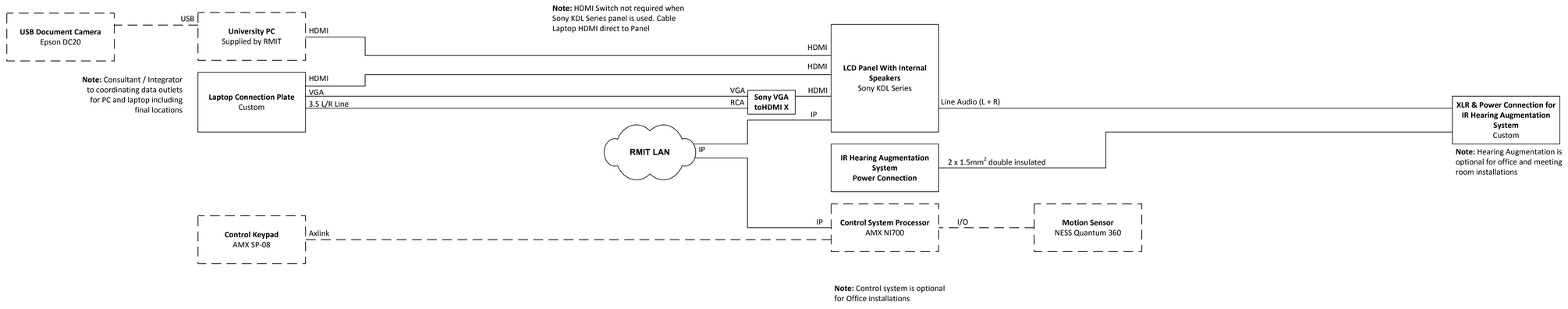
AV00-20I



AV00-20P



AV00-20L



Note: Dashed line indicates the item is an option that may be include in the standard design.

E	ITS AVS 2.2 ISSUE	22 Aug 14	AR
D	SEE AV STANDARDS APPENDIX J	09 SEP 13	DM
C	EQUIPMENT UPDATES	15 MAY 13	DM
B	I/R HEARING POWER	11 APR 13	DM
A	V2.0 APPROVED FOR ISSUE	5 PR 13	DM

RMIT UNIVERSITY

AV SYSTEM SCHEMATICS

AV00-20X

SIZE	REF	DWG NO	REV
A1		AV0001	E
SCALE NTS		SHEET 1 OF 1	

C. AV20-70 Schematics

Wired Boundary Microphone
Beyerdynamic BM32B

Mic

Wireless Mic
Revolabs HD MIC WEAR

Wireless Mic Rx
Revolabs HD Venue Base Station/ Receiver

Line

University PC Monitor
Supplied By RMIT

USB Document Camera
Epson DC20

USB

University PC
Supplied By RMIT

HDMI

Note: Consultant / Integrator to coordinating data outlets for PC and laptop including final locations

Laptop Connection Plate
Custom

HDMI
VGA
Line (L+R)

STP

Note: STP to be installed for future Camera. The cable shall run from the rack to a suitable location. Power and data are required at the same location.

Wireless Touch Panel
Ipad Air with Bounce Pad mount

AV Scaling Presentation Switch
Extron IN1606

Variable
Line (L + R)

Left FOH Speaker
Australian Monitor
AMPAV30W

Right FOH Speaker
Australian Monitor
AMPAV30W

Fixed
Line (mono)
Bridged

Audio Amplifier / 100V
Australian Monitor
AMD2100P

Hi Impedance

Ceiling Speakers CCT 1
JBL Control 24CT
Qty to suit space

Hi Impedance

Ceiling Speakers CCT 2
JBL Control 24CT
Qty to suit space

Fixed
Line (mono)
Bridged

IR Hearing Augmentation System Power Connection

2 x 1.5mm^2 double insulated

XLR & Power Connection for IR Hearing Augmentation System
Custom

HDMI

HDMI TP Tx
Extron DTP HDMI 330 Tx

(STP)

HDMI TP Rx
Extron DTP HDMI 330 Rx

HDMI

Video/Data Display Device
NEC P451W,
NEC PA550WG, Sony Bravia

IP

Note: Projector mount(s) by AV Integrator. See AV standards

HDMI

HDMI TP Tx
Extron DTP HDMI 330 Tx

(STP)

HDMI TP Rx
Extron DTP HDMI 330 Rx

Video/Data Display Device
NEC P451W,
NEC PA550WG, Sony Bravia

IP

Note: A scaler may be required if Primary Display Secondary Display have different resolutions or aspects.

IP

Control System Processor
AMX NI700

IP

RMIT LAN

Dimmer Interface
Provided by Electrical Contractor

IP

Motorised Blinds / Curtains Interface
Provided by Electrical Contractor

IP

Server Link
SPL-SB1008-H

IP

- (1.1) Control System
- (1.2) Matrix/Switcher
- (1.3) Echo360
- (1.4) PC
- (1.5) Hearing loop amp, audio Peripherals
- (1.6) CATx extenders, DAs and other peripherals
- (1.7) Doc Camera
- (1.8) Audio Amplifier 1

Motorised Projection Screen
Screen Technics

IP

Motorised Projection Screen
Screen Technics

IP

I/O

Motion Sensor
NESS Quantum 360

I/O

Lectern Motion Sensor
TBA

Note: Dashed line indicates the item is an option that may be include in the standard design.

E	ITS AVS 2.2 ISSUE	22 Aug 14	AR
D	SEE AV STANDARDS APPENDIX J	09 SEP 13	DM
C	EQUIPMENT UPDATES	15 MAY 13	DM
B	I/R HEARING PWR & LECTURE CAPTURE	11 APR 13	DM
A	V2.0 APPROVED FOR ISSUE	5 APR 13	DM

RMIT UNIVERSITY

AV SYSTEM SCHEMATICS

AV20-70

SIZE	REF	DWG NO	REV
A1		AV0002	E

SCALE NTS SHEET 1 OF 3

D. AV50-120 Schematics

Includes schematics for fixed and podium lecterns

Wired Boundary Microphone
Beyerdynamic BM32B

Mic → Mic 1

Wireless Mic
Revolabs HD MIC WEAR

Wireless Mic Rx
Revolabs HD Venue Base Station/ Receiver

Line → Line In 11 L+R

RMIT LAN

Wireless Presenter
Future TBA

HDMI → HDMI - 3

USB Hub
Extron USB HUB4 MAAP Mounted to custom plate

USB

3 x USB

USB Extender Tx
Extron USB Extender Tx

(STP)

USB Extender Rx
Extron USB Extender Rx

USB

University PC
Supplied By RMIT

HDMI → HDMI - 5

To Monitor, Keyboard, Mouse

Blu-ray Player
New Hank BDP 620

HDMI → HDMI – 6

RS232 → PORT 1

Note: Consultant / Integrator to coordinating data outlets for PC and laptop including final locations

Laptop Connection Plate
Custom

HDMI
VGA
Line (L+R)

HDMI TP Tx
AMX AVB-TX-MULTI-DXLINK

(STP) → Dx Link → DX - 7

Document Camera
Elmo P30HD

HDMI
RS-232

HDMI TP Tx
AMX AVB-TX-MULTI-DXLINK

(STP) → Dx Link → DX - 8

Wireless Touch Panel
Ipad Air with Bounce Pad mount

Motion Sensor
For Lectern Camera

I/O

Note: The Lectern Motion sensor is only installed when a PTZ has been included.

LECTERN

PTZ Camera
Sony SRG-300DH

DVI
RS-232

HDMI TP Tx
AMX AVB-TX-MULTI-DXLINK

(STP) → DX → DX - 9

Note: The Camera is to be positioned to capture Lectern and General Presentation area.

RMIT LAN

Media Presentation Switch
AMX DVX 3156 HD SP

Audio Out 1 (L) → Amp (L) → **Left FOH Speaker** JBL Control 25

Audio Out 4 (L+R) → **Audio Amplifier 2** Australian Monitor AMD2100P → **Left FOH Speaker** JBL Control 28 / **Right FOH Speaker** JBL Control 28

Audio Out 1 (R) → Amp (R) → **Right FOH Speaker** JBL Control 25

Note:
Power Amp and Control 28 Speakers
The Speaker and Amp configuration can be used where the Lecture space is large and the high spec'd equipment is required to ensure the audio is sufficient. The internal amp and Ctrl 25 will not be used in the above configuration.

Audio Out 2 (L) → Line (mono) → **Audio Amplifier 1 / 100V** Australian Monitor AMD2100P → Hi Impedance → **Ceiling Speakers CCT 1** JBL Control 24CT Qty to suit space

Audio Out 2 (R) → Line (mono) → Hi Impedance → **Ceiling Speakers CCT 1** JBL Control 24CT Qty to suit space

Audio Out 3 (L+R) → Line (mono) → **Audio DA** Extron MDA 3A → Line (mono) → **Hearing Induction Loop Amplifier** Ampetronics MLD

Note: Low spill Loop to be installed

HDMI - 4 → HDMI- Camera → Camera feed to Primary Video Secondary Display → DVI-I

HDMI - 1 → HDMI- Projector → Projector input to Primary Display Secondary Video → DVI-I

→ **Lecture Capture** Echo 360 → IP → RMIT LAN

DX - 3 → Dx Link → (STP) → **HDMI TP Rx** AMX AVB-RX-DXLINK-HDMI → HDMI → **21.5" Preview Monitor w/ Touch screen** Provided by RMIT → USB → To University PC via USB Hub

Note: Preview Monitor installed on Lectern on articulated arm. AV Integrator must provide articulated arm

LECTERN

DX - 1 → Dx Link → (STP) → **HDMI TP Rx** AMX AVB-RX-DXLINK-HDMI → HDMI → **Video/Data Projector** NEC PA550WG NEC P451W → IP

Note: Projector mount(s) by AV Integrator. See AV standards

HDMI - 2 → HDMI → **HDMI TP Tx** Extron DTP HDMI 330 Tx → (STP) → **HDMI TP Rx** Extron DTP HDMI 330 Rx → HDMI → **Video/Data Projector** NEC PA550WG NEC P451W → IP

IP → RMIT LAN

Dimmer Interface
Provided by Electrical Contractor
IP

Motorised Blinds / Curtains Interface
Provided by Electrical Contractor
IP

Motorised Projection Screen
Screen Technics
IP

Motorised Projection Screen
Screen Technics
IP

IP → **Server Link** SPL-SB1008-H
- (1.1) Control System
- (1.2) Matrix/Switcher
- (1.3) Echo360
- (1.4) PC
- (1.5) Hearing loop amp, audio Peripherals
- (1.6) CATx extenders, DAs and other peripherals
- (1.7) Doc Camera
- (1.8) Audio Amplifier 1

IP → **Server Link** SPL-SB1008-H
- (2.1) Audio Amplifier 2
- (2.2) Bluray
- (2.3) PTZ Camera PSU
- (2.40) Spare
- (2.5) Spare
- (2.6) Spare
- (2.7) Spare
- (2.8) Spare

I/O → **Motion Sensor** NESS Quantum 360

RS232/ RS485/I/O → **EWIS Interface Provided by Others**

Note: Dashed line indicates the item is an option that may be include in the standard design.

G	ITS AV5 2.2 ISSUE	22 Aug 14	AR
F	SEE AV STANDARDS APPENDIX J	09 SEP 13	DM
E	SERVER LINK	06 JUN 13	DM
D	EQUIPMENT UPDATES	15 MAY 13	DM
C	Amend TSC size	23 APR 13	DM
B	I/R HEARING PWR & LECTURE CAPTURE	11 APR 13	DM
A	V2.0 APPROVED FOR ISSUE	05 APR 13	DM

RMIT UNIVERSITY

AV SYSTEM SCHEMATICS

AV50-120

Podium Lectern – Remote Equipment Rack

SIZE	REF	DWG NO	REV
A1		AV0003	G

SCALE NTS SHEET 1 OF 2

LECTERN

Wired Boundary Microphone
Beyerdynamic BM32B
Mic → Mic 1

Wireless Mic
Revolabs HD MIC WEAR

Wireless Mic Rx
Revolabs HD Venue Base Station/ Receiver
Line → Line In 11 L+R

RMIT LAN

Wireless Presenter
Future TBA
DVI → Multi In - 3
3.5mm TRS → Line In 3 L+R

USB Hub
Extron USB HUB4 MAAP
Mounted to custom plate
USB
3 x USB

To Monitor, Keyboard, Mouse

University PC
Supplied By RMIT
USB
HDMI → HDMI - 5

Blu-ray Player
New Hank BDP 620
HDMI → HDMI – 6
RS232 → PORT 1

Note: Consultant / Integrator to coordinating data outlets for PC and laptop including final locations

Laptop Connection Plate
Custom
HDMI → HDMI - 7
VGA → DVI-I → Multi In - 4
Line (L+R) → 3.5mm TRS → Line In 4 L+R

Media Presentation Switch
AMX DVX 3155 HD SP

Document Camera
Elmo P30HD
HDMI → HDMI → HDMI - 8
RS-232 → RS-232 → PORT 2

Motion Sensor
For Lectern Camera
I/O

Note: The Lectern Motion sensor is only installed when a PTZ has been included.

PTZ Camera
Sony SRG-300DH
DVI
RS-232

HDMI TP Tx
AMX AVB-TX-MULTI-DXLINK
(STP) → DX → DX - 9

Note: The Camera is to be positioned to capture both the Speaker and the room.

RMIT LAN

Wireless Touch Panel
Ipad Air with Bounce Pad mount

Audio Out 1 (L) → Amp (L) → **Left FOH Speaker** JBL Control 25
Audio Out 4 (L+R) → **Audio Amplifier 2** Australian Monitor AMD2100P → **Left FOH Speaker** JBL Control 28 / **Right FOH Speaker** JBL Control 28
Audio Out 1 (R) → Amp (R) → **Right FOH Speaker** JBL Control 25

Audio Out 2 (L) → Line (mono) → Bridged → **Audio Amplifier 1 / 100V** Australian Monitor AMD2100P → Hi Impedance → **Ceiling Speakers CCT 1** JBL Control 24CT Qty to suit space
Audio Out 2 (R) → Line (mono) → Bridged → **Audio Amplifier 1 / 100V** Australian Monitor AMD2100P → Hi Impedance → **Ceiling Speakers CCT 1** JBL Control 24CT Qty to suit space

Note:
Power Amp and Control 28 Speakers The Speaker and Amp configuration can be used where the Lecture space is large and the high spec'd equipment is required to ensure the audio is sufficient. The internal amp and Ctrl 25 will not be used in the above configuration.

Audio Out 3 (L+R) → Line (mono) → Bridged → **Audio DA** Extron MDA 3A → Line (mono) → **Hearing Induction Loop Amplifier** Ampetronics MLD

Note: Low spill Loop to be installed

HDMI - 4 HDMI- Camera → Camera feed to Primary Video Secondary Display → DVI-I
HDMI - 1 HDMI- Projector → Projector input to Primary Display Secondary Video → DVI-I
→ Line (mono) → **Lecture Capture** Echo 360 → IP → RMIT LAN

HDMI - 3 HDMI → HDMI → **21.5" Preview Monitor w/ Touch screen** Provided by RMIT → USB → To University PC

Note: Preview Monitor installed on Lectern on articulated arm. AV Integrator must provide articulated arm

DX - 1 Dx Link → (STP) → **HDMI TP Rx** AMX AVB-RX-DXLINK-HDMI → HDMI → **Video/Data Projector** NEC PA550WG NEC P451W → IP

Note: Projector mount(s) by AV Integrator. See AV standards

HDMI - 2 HDMI → **HDMI TP Tx** Extron DTP HDMI 330 Tx → (STP) → **HDMI TP Rx** Extron DTP HDMI 330 Rx → HDMI → **Video/Data Projector** NEC PA550WG NEC P451W → IP

IP → RMIT LAN

Dimmer Interface Provided by Electrical Contractor — IP
Motorised Blinds / Curtains Interface Provided by Electrical Contractor — IP
Motorised Projection Screen Screen Technics — IP
Motorised Projection Screen Screen Technics — IP

RMIT LAN → IP → **Server Link** SPL-SB1008-H
- (1.1) Control System
- (1.2) Matrix/Switcher
- (1.3) Echo360
- (1.4) PC
- (1.5) Hearing loop amp, audio Peripherals
- (1.6) CATx extenders, DAs and other peripherals
- (1.7) Doc Camera
- (1.8) Audio Amplifier 1

RMIT LAN → IP → **Server Link** SPL-SB1008-H
- (2.1) Audio Amplifier 2
- (2.2) Bluray
- (2.3) PTZ Camera PSU
- (2.40) Preview monitor
- (2.5) Spare
- (2.6) Spare
- (2.7) Spare
- (2.8) Spare

I/O → **Motion Sensor** NESS Quantum 360

RS232/ RS485/I/O → **EWIS Interface Provided by Others**

Note: Dashed line indicates the item is an option that may be include in the standard design.

E	ITS AVS 2.2 ISSUE	22 Aug 14	AR
F	SEE AV STANDARDS APPENDIX J	09 SEP 13	DM
E	SERVER LINK	06 JUN 13	DM
D	EQUIPMENT UPDATES	15 MAY 13	DM
C	Amend TSC size	23 APR 13	DM
B	I/R HEARING PWR & LECTURE CAPTURE	11 APR 13	DM
A	V2.0 APPROVED FOR ISSUE	05 APR 13	DM

RMIT UNIVERSITY

AV SYSTEM SCHEMATICS

AV50-120
Fixed Lectern with Integral AV Rack

SIZE	REF	DWG NO	REV
A1		AV0003.1	E

SCALE NTS SHEET 2 OF 2

E. AV90-360 Schematics

Wired Boundary Microphone
Beyerdynamic BM32B

Wired Boundary Microphone
Beyerdynamic BM32B

Wireless Mic
Revolabs HD MIC WEAR

Wireless Mic
Revolabs HD MIC WEAR

Wireless Handheld Mic
AKG HT 450

Wireless Handheld Mic
AKG HT 450

Wireless Mic Charger
AKG CU400

LECTERN

Note: Revolabs Charger to be installed on Lecterm

Mic
Mic

Wireless Mic Rx
Revolabs HD Venue Dual Base Station/ Receiver

Wireless Mic Rx
AKG SR450
(WMS 450 Set)

Wireless Mic Rx
AKG SR450
(WMS 450 Set)

Line
Line
Line

EWIS Interface
Provided by Others

Line (L+R)
I/O
Line (L+R)

Audio DSP
Tesira Fortei C1

Line (L)
Line (R)
Line (mono)
Line (mono)
Line (L+R)
Line (L+R)
Line (L+R)
Mic
USB
IP
Line (L+R)
HDMI
HDMI
HDMI
Line (L+R)
HDMI
HDMI
HDMI
HDMI
XTP Out
XTP Out
XTP Out
IP

Audio Amplifier
Australian Monitor
AMD2100P

Audio Amplifier / 100V
Australian Monitor
AMD2100P

Amp (L)
Amp (R)
Hi Impedance
Hi Impedance

Left FOH Speaker
JBL Control 28

Right FOH Speaker
JBL Control 28

Ceiling Speakers CCT 1
JBL Control 24CT
Qty to suit space

Ceiling Speakers CCT 1
JBL Control 24CT
Qty to suit space

Note: Voice reinforcement to be mix minus if the space requires.

Line (L+R)

Hearing Induction Loop Amplifier
Ampetronics MLD

Note: Low spill Loop to be installed

Line (L+R)
Mic
HDMI Camera
DVI Content

VC CODEC
Cisco C40

Line (L+R)
HDMI
DVI
IP

RMIT LAN

Line (L+R)
Camera feed to Primary Video Secondary Display
Projector input to Primary Display Secondary Video

DVI Camera
DVI Content

Lecture Capture
Echo 360

IP

Note:
When a WPD is include in the system the CrossPoint frame will need to a 16x16 with an additional XTPCP4i

RMIT LAN

Wireless Presenter
Future TBA

(STP)

EXTRON HDMI XTP RX
XTP Scaling Receiver

HDMI

21.5" Preview Monitor w/ Touch screen
Provided by RMIT

USB

To University PC

Note: Preview Monitor installed on Lectern on articulated arm. AV Integrator must provide articulated arm

LECTERN

To Monitor, Keyboard, Mouse

3 x USB
USB

USB Extender Tx
Extron USB Extender Tx

(STP)

USB Extender Rx
Extron USB Extender Rx

USB

University PC
Supplied By RMIT

USB
HDMI

USB Hub
Extron USB HUB4 MAAP
Mounted to custom plate

Blu-ray Player
New Hank BDP 620

HDMI
RS232

HDMI
HDMI

Media Presentation Switch
Extron XTP 8x8
CrossPoint 1600
Frame 60-1250-01 x 1
XTP CP 4i 70-940-01 x 2
XTP CP 4i HDMI 70-685-11 x 1
XTP CP 4o 70-943-01 x 1
XTP CP 4o HDMI 70-687-11 x 1

(STP)

EXTRON HDMI XTP RX
XTP Scaling Receiver

HDMI

Video/Data Projector
NEC PA550WG

IP

Note: Projector mount(s) by AV Integrator. See AV standards

OFE Laptop

HDMI
VGA
Line (L+R)

HDMI Tx
Extron XTP T USW 103
60-1198-01

(STP)
XTP

Document Camera
Elmo P30S

HDMI
RS-232

HDMI Tx
Extron XTP T HDMI
60-1043-12

(STP)
XTP

LECTERN

RMIT LAN

PTZ Camera
Sony SRG-300DH

DVI
RS-232

HDMI Tx
Extron XTP T HDMI
60-1043-12

(STP)
XTP

PTZ Camera
Sony SRG-300DH

DVI
RS-232

HDMI Tx
Extron XTP T HDMI
60-1043-12

(STP)
XTP

RMIT LAN

Dimmer Interface
Provided by Electrical Contractor

Motorised Projection Screen
Screen Technics

Motorised Projection Screen
Screen Technics

Motorised Blinds / Curtains Interface
Provided by Electrical Contractor

IP
IP
IP
IP

Server Link
SPL-SB1008-H

IP

- (1) Control System
- (1.2) Matrix/Switcher
- (1.3) Echo360
- (1.4) PC
- (1.5) Hearing loop amp, audio Peripherals
- (1.6) CATx extenders, DAs and other peripherals
- (1.7) Spare
- (1.8) Audio Amplifier 1

Server Link
SPL-SB1008-H

IP

- (2.1) Audio Amplifier 2
- (2.2) Bluray
- (2.3) PTZ Camera PSU
- (2.4) Spare
- (2.5) Spare
- (2.6) Spare
- (2.7) Spare
- (2.8) Spare

Wireless Touch Panel
Ipad Air with Bounce Pad mount

Motion Sensor
Lectern Model TBA

LECTERN

RS232
I/O

AMX Control
NI 700

I/O

Motion Sensor
NESS Quantum 360

RMIT LAN

IP

Note: Dashed line indicates the item is an option that may be include in the standard design.

G	ITS AVS 2.2 ISSUE	22 Aug 14	AR
F	SEE AV STANDARDS APPENDIX J	09 SEP 13	DM
E	SERVER LINK	6 JUN 13	DM
D	EQUIPMENT UPDATES	15 MAY 13	DM
C	Added Handheld Mic Charger	23 APR 13	DM
B	GENERAL AMENDMENTS & LECTURE CAPTURE	11 APR 13	DM
A	V2.0 APPROVED FOR ISSUE	5 APR 13	DM

RMIT UNIVERSITY

AV SYSTEM SCHEMATICS

AV90-360 (VC)

SIZE	REF	DWG NO	REV
A1		AV0004	G
SCALE	NTS	SHEET	1 OF 1

F. AV Collab Schematics

Wired Boundary Microphone
Beyerdynamic BM32B

Mic

Wireless Mic
Revolabs HD MIC

Note: Type and quantity of Wireless units to be decided on a specific installation requirements.

Wireless Mic Rx
Revolabs HD Venue Base Station/ Receiver

Line

RMIT LAN

Wireless Presenter
Future TBA

HDMI

USB Document Camera
Epson DC20

USB

University PC
Supplied By RMIT

HDMI

Note: Consultant / Integrator to coordinating data outlets for PC and laptop including final locations

Laptop Connection Plate
Custom

HDMI
VGA
Line (L+R)

AV Scaling Presentation Switch
Extron IN1608

Variable — Line (L mono) — Bridged

Variable — Line (R mono) — Bridged

Audio Amplifier / 100V
Australian Monitor
AMD2100P

Hi Impedance

Ceiling Speakers CCT 1
JBL Control 24CT
Qty to suit space

Hi Impedance

Ceiling Speakers CCT 1
JBL Control 24CT
Qty to suit space

Fixed — Line (mono)

XLR & Power Connection for IR Hearing Augmentation System
Custom

IR Hearing Augmentation System Power Connection Plate

2 x 1.5mm^2 double insulated

Note: LCD mounts by AV Integrator. See AV standards

HDMI — HDMI

HDMI DGKat DA/Tx
Kramer VM-114H4C

DGKat (STP)

DGKat Rx
Kramer VM-114 H2C

Kramer
PT-101Hxl

HDMI

LCD Panel With Speakers + Embedded PC
NEC P553 + ARK-DS262GF-U5A1E, 8GB Ram, No OS

IP

DGKat (STP)

DGKat Rx
Kramer VM-114 H2C

Kramer
PT-101Hxl

HDMI

LCD Panel With Speakers + Embedded PC
NEC P553 + ARK-DS262GF-U5A1E, 8GB Ram, No OS

IP

DGKat

For designs with more than 8 panels, cascade additional Kramer VM-114H4Cs

DGKat
DGKat
DGKat
DGKat

HDMI — HDMI

HDMI DGKat DA/Tx
Kramer VM-114H4C

DGKat (STP)

DGKAT Rx
Kramer VM-114 H2C

Kramer
PT-101Hxl

HDMI

LCD Panel With Speakers + Embedded PC
NEC P553 + ARK-DS262GF-U5A1E, 8GB Ram, No OS

IP

IP

Wireless Touch Panel
Ipad Air with Bounce Pad mount

Control System Processor
AMX NI700

IP

RMIT LAN

Dimmer Interface
Provided by Electrical Contractor

IP

Motorised Blinds / Curtains Interface
Provided by Electrical Contractor

IP

IP

Server Link
SPL-SB1008-H

(1.1) Control System
(1.2) Matrix/Switcher
(1.3) Spare
(1.4) PC
(1.5) Hearing loop amp, audio Peripherals
(1.6) CATx extenders, DAs and other peripherals
(1.7) Doc Camera
(1.8) Audio Amplifier 1

I/O

Motion Sensor
NESS Quantum 360

Note: Dashed line indicates the item is an option that may be include in the standard design.

F	ITS AVS 2.2 ISSUE	22 Aug 14	AR
E	SEE AV STANDARDS APPENDIX J	09 SEP 13	DM
D	EQUIPMENT UPDATES	15 MAY 13	DM
C	LCD panel changed to new model	23 APR 13	DM
B	I/R HEARING PWR	11 APR 13	DM
A	V2.0 APPROVED FOR ISSUE	5 APR 13	DM

RMIT UNIVERSITY

AV SYSTEM SCHEMATICS

AVCollab

SIZE	REF	DWG NO	REV
A1		AV0005	F
SCALE NTS		SHEET	1 of 1

G. AVVC Schematics

Note:
Quantity & type of microphone(s) is environment dependant.

Any microphone from the RMIT approved list of microphones can be used in the space.

To use more microphones that the Presentation Switcher can handle, include the DSP into the system design.

Up to 8 Wired/Wireless Microphones as Required (AEC on Ch1-8)

12 Mic/Line

DSP
Extron DMP 128

Line (L)

Line (R)

IP

Audio Amplifier
Australian Monitor
AMD2100P

Amp (L)

Amp (R)

Left FOH Speaker
JBL Control 28

Right FOH Speaker
JBL Control 25/28

RMIT LAN

EWIS Interface
Provided by Others

I/O

Expansion

(STP)

DMP Expansion

Amp Out (L)

Amp Out (R)

Left FOH Speaker
JBL Control 25

Right FOH Speaker
JBL Control 25

NOTE: Use Presentation Switch amplifier in small rooms. In larger rooms, FOH is to be via DSP

Note:
At a minimal, a wired boundary microphone must be provided in the room for an audio feed to the assistive hearing system.

If this cannot be accommodated at table/lectern level, this it shall be mounted in an alternative position.

Wired Boundary
Microphone
Beyerdynamic BM32B

Mic

Up to 3 Wired/Wireless Microphones as Required

Mic/Line

HDMI

HDMI

Line (L+R)

Ch 1 Line (mono)

Ch 2 Line (mono)

Ch 3 Line (mono) - Bridged

Ch 4 Line (mono)

Ch 5/6 Line (L+R)

Ch 7/8 Line (L+R)

Audio Amplifier / 100V
Australian Monitor
AMD2100P

Hi Impedance

Ceiling Speakers CCT 1
JBL Control 24CT
Qty to suit space

NOTE: Speaker selection will be determined on the room size.

Hi Impedance

Ceiling Speakers CCT 2
JBL Control 24CT
Qty to suit space

NOTE: Voice reinforcement to be mix minus if the space requires.

IR Hearing
XLR & Power Connection
Augmentation plate

2 x 1.5mm² double insulated cable

IR Emitter
Sennheizer SZ1015

NOTE: Power feed ro IR on a cord mount jack connected to IR power supply in rack

Line (L+R)

HDMI

Video Bridge
Vaddio 999-8210-001

IP

USB

USB to RMIT PC

Wireless Presenter
Future TBA

HDMI

Presentation Switcher
Extron DTP CrossPoint
84IPCP

HDMI DA
Extron HDMI DA 2
60-997-01

HDMI

Line (L+R)

DVI

Mic

HDMI

HDMI Camera

Line (L+R)

VC CODEC
Cisco C40

DVI Content

IP

USB from Vaddio Bridge

University PC
Supplied By RMIT

HDMI

DTP Out

(STP)

HDMI RX
Extron 330 DTP
60-1331-13

HDMI

Display
NEC PA451WG/
Sony Pro Bravia

IP

DTP Out

(STP)

HDMI RX
Extron 330 DTP
60-1331-13

HDMI

Display
NEC PA451WG/
Sony Pro Bravia

IP

Note: Projector mount(s) by AV Integrator. See AV standards

Laptop
Supplied by RMIT

HDMI
VGA
Line (L+R)

HDMI Tx
Extron DTP T USW 233
60-1392-12

(STP)

DTP

PTZ Camera
Sony SRG-300DH

HDMI

HDMI Tx
Extron 330 DTP
60-1331-12

(STP)

DTP

RMIT LAN

IP

PTZ Camera
Sony SRG-300DH

HDMI

HDMI Tx
Extron 330 DTP
60-1331-12

(STP)

HDMI RX
Extron 330 DTP
60-1331-13

HDMI

Dimmer Interface
Provided by Electrical Contractor

IP

Motorised Projection Screen
Screen Technics

IP

Motorised Projection Screen
Screen Technics

IP

Motorised Blinds / Curtains Interface
Provided by Electrical Contractor

IP

PDU 1
Server Link
SPL-SB1008-H

IP

- (1.1) Control System
- (1.2) Matrix/Switcher
- (1.3) PTZ Camera PSU
- (1.4) PC
- (1.5) Hearing loop amp, audio Peripherals
- (1.6) CATx extenders, DAs and other peripherals
- (1.7) Audio Amplifier 1
- (1.8) Audio Amplifier 2 (if required)

Motion Sensor
Lectern Model TBA

I/O

Control System
AMX NI 700

Wireless Touch Panel
Ipad Air with Bounce Pad mount

RMIT LAN

IP

I/O

Motion Sensor
NESS Quantum 360

NOTE: Dashed line indicates the item is an option that may be include in the standard design.

A	ITS AVS V2.2 ISSUE	22 Aug 14	AR

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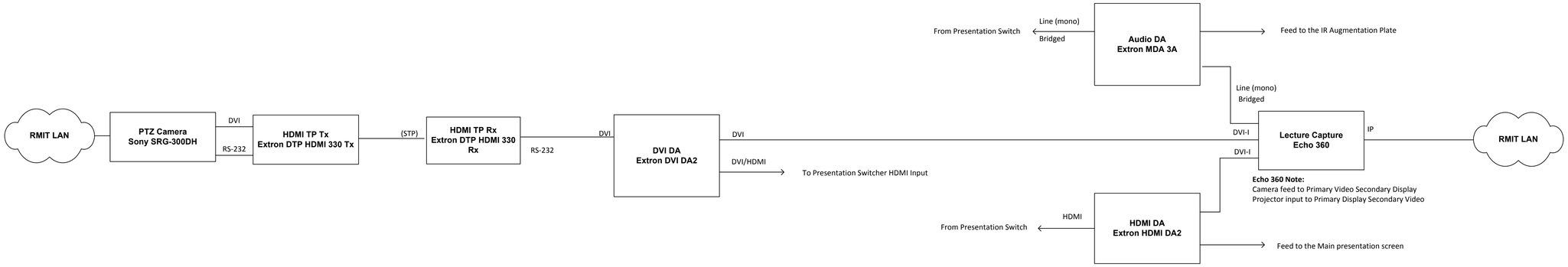
AV SYSTEM SCHEMATICS

AVVC LRG

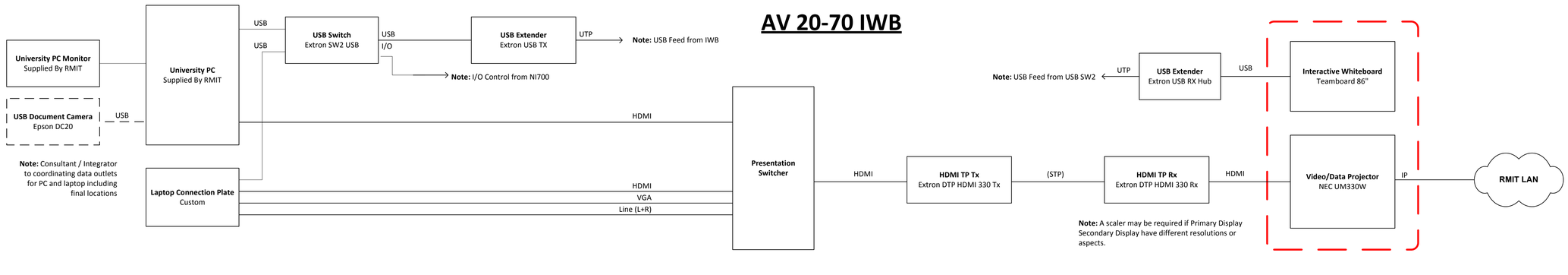
SIZE	REF	DWG NO	REV
A1		AV0009	A
SCALE	NTS	SHEET	1 Of 1

G. Building Block Schematics

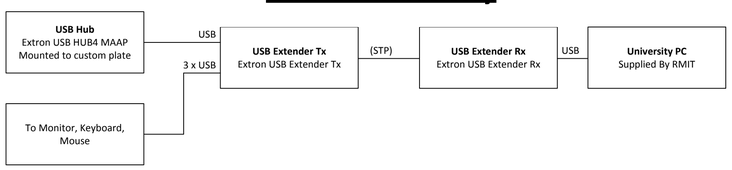
Lecture Capture



AV 20-70 IWB

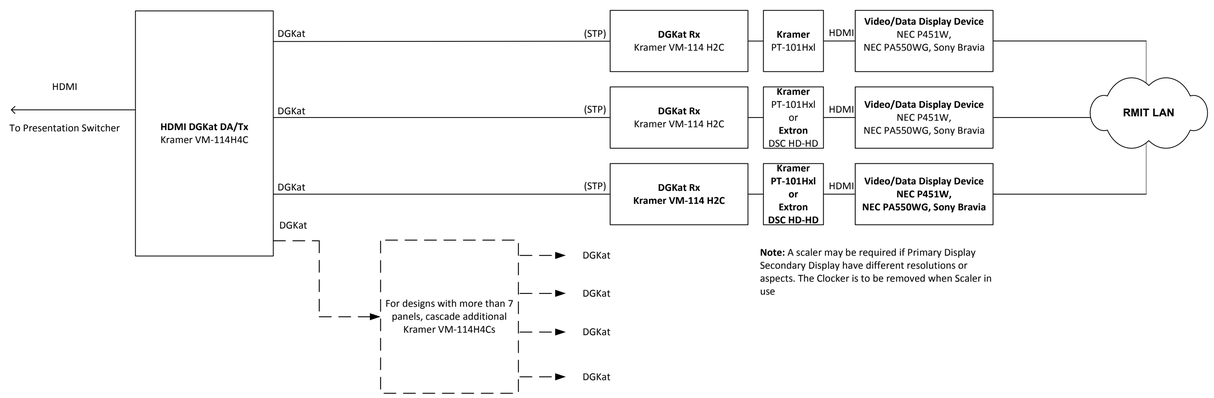


USB Connectivity



Future Wireless Presenter

AV Multi Screen



Note: Dashed line indicates the item is an option that may be include in the standard design.

A	ITS AVS ISSUE 2.2	22 Aug 14	AR

RMIT UNIVERSITY

AV SYSTEM SCHEMATICS

AV20-70 Building Blocks

SIZE	REF	DWG NO	REV
A1		AV0002	A
SCALE	NTS	SHEET	1 of 1

H. RMIT AV Goods List & Minimum Specifications

AV Standard Equipment List

RMIT UNIVERSITY

Category	Supplier	Brand	Description	Part Number
Audio	Amber Technology	Gefen	SPDIF to Line Analogue Audio	GTV-DIGAUD-2-AAUD
Audio	Audio Products Group	BiAmp	Digital Signal Processor	Nexia CS
Audio	Audio Products Group	BiAmp	Digital Signal Processor with AEC	Nexia VC
Audio	Audio Products Group	BiAmp	Digital Signal Processor with AEC	Tesira Forte C1
Audio	Audio Products Group	Revolabs	Boundary Microphone	HDTBLMIC-OM
Audio	Audio Products Group	Revolabs	Dual Receiver and Charging unit	HDDUAL
Audio	Audio Products Group	Revolabs	Lapel Microphone	HDMICWEAR
Audio	Audio Products Group	Revolabs	Single Receiver and Charging unit	HDSGL
Audio	Hills SVL	Ampetronic	Hearing Loop Amplifier	MDA To suit
Audio	Hills SVL	Australian Monitor	Audio Amplifier	AMD2100P
Audio	Hills SVL	Australian Monitor	Audio Amplifier	AMD2200P
Audio	Hills SVL	Australian Monitor	Speaker Active	AMPAV30W pr
Audio	Hills SVL	Beyer Dynamic	Boundary Microphone	BM32B
Audio	Jands Electronics	JBL	Ceiling Speaker	Control 24CT
Audio	Jands Electronics	JBL	Ceiling Speaker	Control 26CT
Audio	Jands Electronics	JBL	Speaker Front of House	CBT 50LA-LS
Audio	Jands Electronics	JBL	Speaker Front of House	Control 25
Audio	Jands Electronics	JBL	Speaker Front of House	Control 28
Audio	Production Audio Services	Radio Design Labs	Audio distribution Amplifier (mono)	ST-DA3
Audio	RGB Integration	Extron	Audio DA MDA 3A	60-440-01
Audio	Syntec	Sennheiser	Infrared Hearing Augmentation neck loop	EZT-3011
Audio	Syntec	Sennheiser	Infrared Hearing Augmentation Receiver	RI-830-S
Audio	Syntec	Sennheiser	Infrared Hearing Augmentation Transmitter	SZI 1015TW
Audio	Audio Products Group	AKG	Dual Desk Top Charger	CU400
Audio	Audio Products Group	AKG	Handheld Diversity Radio Microphone	WMS450HTC
Camera	CR Kennedy	Elmo	Document Camera	P30HD
Camera	Epson Australia	Epson	Document Camera	ELP-DC20
Camera	Sony Australia	Sony	PTZ camera	SRG-300DH
Capture	Echo 360 Inc	Echo 360	Lecture Capture	ES-HW-PRO001
Control	AMX	AMX	10" Touch Screen Controller	MXT-1000-NC
Control	AMX	AMX	7" Touch Screen Controller	MSD-701
Control	AMX	AMX	All in 1 Switch	DVX2150 SP
Control	AMX	AMX	Keypad Controller	SP-08-AX
Control	AMX	AMX	System Processor	NI700
Control	Apple	Apple	iPad with Retina display Wi-Fi 16GB - Black	MD510X/A
Control	Axis AV	Global Cache	IP to RS232	iTash - IP2SL
Control	Comsol	Serverlink	Power distribution unit IP	SLP-SB1008-H
Control	Ness	Ness	Quantum 360	100-048
Control	RGB Integration	Extron	SW2 USB	60-952-02
Control	RGB Integration	Extron	USB Extender HUB 4 MAAP	60-1030-11
Control	RGB Integration	Extron	USB Extender RX	60-871-72
Control	RGB Integration	Extron	USB Extender TX	60-871-62
Digital Signage	Dell	Dell	All in One PC, touch screen	OptiPlex 9020 All-in-One
Digital Signage	NEC	NEC	Digital Signage player	NEC Live2
Digital Signage	NEC	NEC	NEC Live Software license for use with All in One PC	
IPTV	Amino	Combitel	IPTV receiver	A140
Mounting	Bounce Pad	Bounce Pad	Bounce Pad, Desk Mount, Standard, Covered Camera & Home	
Mounting	Chanohm	Omni	LCD Mounting Bracket, counter leaver	Rapidmount Torsion Twist
Mounting	Elgee	Elgee	Equipment rack	Zip Rack
Mounting	Elgee Sheet Metal	Elgee	AMX Touch screen controller surface mount box	
Mounting	Illumination Systems	Middle Atlantic	In-Lectern Equipment Rack	SRSR4xx series
Mounting	MFB	MFB	Equipment rack	S2005B
Mounting	Rack Technologies	Rack Technologies	Equipment rack	19"C series
Mounting	Ultralift Australia	Ultralift	LCD Mounting Bracket	Rapidmount Torsion Twist
Mounting	Ultralift Australia	Ultralift	UniLift Projector lifter	Custom
Video	AMX	AMX	Room scaling receiver	RX-HDMI-DXLINK
Video	AMX	AMX	Room Transmitter Multi format	TX-MULTI-DXLINK
Video	Corsair	Newhank	Blu-ray player/1 RU/RS232	BDP 620
Video	Kramer Australia	Kramer	HDMI Extender/Distribution Amp	VM-114 H4C
Video	Kramer Australia	Kramer	HDMI TP Receiver	PT-572+ DGKat Receiver
Video	NEC	NEC	Projector - Pro Install	NP-PA500U

AV Standard Equipment List

Category	Supplier	Brand	Description	Part Number
Video	NEC	NEC	Projector - Pro Install	NP-UM330W
Video	RGB Integration	Extron	CrossPoint 1600 C/W IP/OP cards	
Video	RGB Integration	Extron	HDMI Distribution Amplifier	60-997-01
Video	RGB Integration	Extron	HDMI Distribution Amplifier	60-997-01
Video	RGB Integration	Extron	HDMI Extender 330 RX	60-1331-13
Video	RGB Integration	Extron	HDMI Extender 330 TX	60-1331-12
Video	RGB Integration	Extron	Scaling presentation Switch IN1606	60-1081-01
Video	RGB Integration	Extron	Scaling presentation Switch IN1608	60-1238-01
Video	RGB Integration	Extron	Scaling Switch DVS 605	60-1059-01
Video	RGB Integration	Extron	XTP T HDMI	60-1043-12
Video	RGB Integration	Extron	XTP T USW 103	60-1198-01
Video	Screen Technics	Screen Technics	Projection Screen	Lecturer Series
Video	Sony Australia	Sony	LCD - Meeting/office	Bravia Pro
Video	Ultralift Australia	Ultralift	LCD Mounting Bracket	Fusion Wall Mount
Video	Ultralift Australia	Ultralift	LCD Mounting Bracket	Fusion Wall Tilt
Video	Ultralift Australia	Ultralift	Secure projector Mounting Bracket with Equipment cage	J745.2
Video	NEC	NEC	LCD - Class/Digital Signage	P- Series
Video	NEC	NEC	Lens for PA550WG	NP13ZL
Video	NEC	NEC	Projector - Pro Install	NP-PA550WG
Video	RGB Integration	Extron	DVI Distribution Amplifier DVI DA 2	60-886-02
Video	RGB Integration	Extron	SW2 HDMI	60-841-21
Video/Control	AMX	AMX	All in 1 Switch	DVX2155 SP,
Video/Control	AMX	AMX	All in 1 Switch	DVX3155HD-SP
Video/Control	AMX	AMX	All in 1 Switch	DVX3156HD-Sp
Videoconference	DIDATA	Cisco	Video Conferencing Codec	C40
Whiteboard	Teamboard	Teamboard	Interactive White Board	HDI-86I-EDU

I. RMIT Handover Approval Form Template

AV Handover Approval Form

Acceptance into Maintance

Project Details

RMIT Project Reference:
Project Name:
Building Address:

Room No./Space:

AV Contractor:

AV Contractor's Project Manager: (Consultant)

AV Contractor's Commissioning Manager:

Date of Commissioning: 9/07/2014

Notes:

Item		Pass	Fail	N/A	Comments / Notes
Keypad	Layout	☐	☐	☐	
	Function	☐	☐	☐	
	RMS	☐	☐	☐	
Touch Panel	Layout	☐	☐	☐	
	Labels	☐	☐	☐	
	Function	☐	☐	☐	
	RMS	☐	☐	☐	
	GUI	☐	☐	☐	
Resident PC	Network Login	☐	☐	☐	
	Video	☐	☐	☐	
	Audio	☐	☐	☐	
	Required software Present	☐	☐	☐	
	Blu-Ray functioning	☐	☐	☐	
	T`screen function	☐	☐	☐	
USB Hub connectivity	Lectern/Hub Connection	☐	☐	☐	
USB Document Camera/Doc Cam	Software	☐	☐	☐	
	Video	☐	☐	☐	
	Control/Zoom/ Focus/Light	☐	☐	☐	
Blu-ray Drive	Software	☐	☐	☐	
	Video	☐	☐	☐	
	Audio	☐	☐	☐	
Laptop Digital	Video	☐	☐	☐	
	Audio	☐	☐	☐	
Laptop Analogue	Audio	☐	☐	☐	
	Video	☐	☐	☐	
Blu-ray Player	Audio	☐	☐	☐	
	Video	☐	☐	☐	
	Play	☐	☐	☐	
	Stop	☐	☐	☐	
	Fwd / Rev	☐	☐	☐	

	Next/Prev	☐	☐	☐	
	Menu	☐	☐	☐	
	Navigation	☐	☐	☐	
	Enter	☐	☐	☐	
	Eject	☐	☐	☐	
VC System	Address Book Populated	☐	☐	☐	
	Camera Control Near	☐	☐	☐	
	Camera Control Far	☐	☐	☐	
	Video	☐	☐	☐	
	Audio	☐	☐	☐	
	Test Call Internal	☐	☐	☐	
	Test Call External	☐	☐	☐	
	AEC	☐	☐	☐	
	Privacy Button	☐	☐	☐	
Integration	Control	☐	☐	☐	
	TMS	☐	☐	☐	
Boundary Microphone 1	Audio	☐	☐	☐	
Boundary Microphone 2	Audio	☐	☐	☐	
Wireless Lapel Mic 1	Audio	☐	☐	☐	
Wireless Lapel Mic 2	Audio	☐	☐	☐	
Wireless Handheld Mic 1	Audio	☐	☐	☐	
Wireless Handheld Mic 2	Audio	☐	☐	☐	
PTZ Camera Main (Room)	Video	☐	☐	☐	
	Control	☐	☐	☐	
	Preset 1 Lectern	☐	☐	☐	
	Preset 2 Presenter	☐	☐	☐	
	Preset 3 Audience	☐	☐	☐	
	Preset 4 User	☐	☐	☐	
	PIR Function	☐	☐	☐	
PTZ Camera 2	Video	☐	☐	☐	
	Control				
	Preset 1 Lectern	☐	☐	☐	
	Preset 2 Presenter	☐	☐	☐	
	Preset 3 Audience	☐	☐	☐	
	Preset 4 User	☐	☐	☐	
	PIR Function	☐	☐	☐	
Projector 1 Focus/ Allignment/	Video	☐	☐	☐	
Projector 2 Focus/ Allignment/ Sepparation	Video	☐	☐	☐	
Local Preview Monitor (AV50-120 or above)	Video	☐	☐	☐	
LCD Panel 1	Audio	☐	☐	☐	
	Video	☐	☐	☐	
	Control	☐	☐	☐	
LCD Panel 2	Audio	☐	☐	☐	
	Video	☐	☐	☐	
	Control	☐	☐	☐	
LCD Panel 3	Audio	☐	☐	☐	
	Video	☐	☐	☐	
	Control	☐	☐	☐	
LCD Panel 4	Audio	☐	☐	☐	
	Video	☐	☐	☐	
	Control	☐	☐	☐	

LCD Panel 5	Audio	☐	☐	☐	
	Video	☐	☐	☐	
	Control	☐	☐	☐	
LCD Panel 6	Audio	☐	☐	☐	
	Video	☐	☐	☐	
	Control	☐	☐	☐	
Interactive Whiteboard	Audio	☐	☐	☐	
	Video	☐	☐	☐	
	Calabration	☐	☐	☐	
	Interactive - Room PC	☐	☐	☐	
	Interactive - Laptop USB	☐	☐	☐	
Echo360	Audio	☐	☐	☐	
	Video	☐	☐	☐	
	Software	☐	☐	☐	
	Recording/ Pause Feedback	☐	☐	☐	
	Camera on the Left Source on the right	☐	☐	☐	
	Camera Operational	☐	☐	☐	
Front of House Speakers	Audio	☐	☐	☐	
Ceiling Speakers	Audio	☐	☐	☐	
Hearing Induction Loop	Hearing Aug	☐	☐	☐	
IR Hearing System	Hearing Aug	☐	☐	☐	
IR Hearing System Plate correct power connector	Physical – Captive lock DC Jack	☐	☐	☐	
HAL Signage	Hearing Aug	☐	☐	☐	
Digital Signage (Timetable)	Room Timetable (90 plus students)	☐	☐	☐	
AV Switching	Audio	☐	☐	☐	
	Video	☐	☐	☐	
Audio DSP	Levels	☐	☐	☐	
	Quality	☐	☐	☐	
	TP Level Control	☐	☐	☐	
Control System	Shutdown	☐	☐	☐	
	Power Shutdown	☐	☐	☐	
PIR/Motion Detector	Movement Registered	☐	☐	☐	
Soft off mode on Shutdown	Display Mutes	☐	☐	☐	
Touch Panel – Help Page	Layout / Text	☐	☐	☐	
	Functionality	☐	☐	☐	
Touch Panel – Tech Pages	Functionality	☐	☐	☐	
Touch Panel – Correct PDU labels and functionality	Layout / Text, Functionality	☐	☐	☐	
Touch Panel – Softoff + Auto off times set	Functionality	☐	☐	☐	
Touch Panel – Remote Access	RMS	☐	☐	☐	
	VNC	☐	☐	☐	
Correct Rack Type used – when closed joinery has been used	Middle Atlantic SRSR4xx , Elgee, MFB	☐	☐	☐	
PDU 1	Correct Funtion/Layout	☐	☐	☐	

	Lablled	☐	☐	☐	
PDU 2	Correct Funtion/Layout	☐	☐	☐	
	Lablled	☐	☐	☐	
Correct Projector screen size used – where specified		☐	☐	☐	
Check security items have been installed	Snake eye Screws	☐	☐	☐	
	Locks	☐	☐	☐	
	Bracket Pins	☐	☐	☐	
	Grub Screws	☐	☐	☐	
	P Clip	☐	☐	☐	
Cabling	Correct type	☐	☐	☐	
Labelling	AV Cables	☐	☐	☐	
	Power Cables Tagged	☐	☐	☐	
Cleanliness		☐	☐	☐	
Correct Projector screen size used – where specified		☐	☐	☐	
Check security items have been supplied	Snake eye Screws	☐	☐	☐	
	Locks	☐	☐	☐	
	Bracket Pins	☐	☐	☐	
Cabling		☐	☐	☐	
Install Quality		☐	☐	☐	
Labelling	AV Cables	☐	☐	☐	
	Power Cables Tagged	☐	☐	☐	
Cleanliness		☐	☐	☐	
Asset Stickers		☐	☐	☐	

Deliverables

Item		Pass	Fail	N/A	Comments / Notes
Equipment Schedule		☐	☐	☐	
Source Codes		☐	☐	☐	
Equipment Config Files		☐	☐	☐	
Firmware – copies of all the latest versions supplied on disk	Version supplied if not standard	☐	☐	☐	
As-built Schematics		☐	☐	☐	
As-built Drawings		☐	☐	☐	
As-built Rack layouts		☐	☐	☐	
As-built Custom Equip		☐	☐	☐	
HAL Design & Certification		☐	☐	☐	
Operational Manuals		☐	☐	☐	
Asset Register		☐	☐	☐	
Test and Tag register		☐	☐	☐	
Quick Reference Guide	Hard Copy	☐	☐	☐	
	Soft Copy	☐	☐	☐	
Manufactuer Manuals		☐	☐	☐	
Warranty Details		☐	☐	☐	
Entered into database		☐	☐	☐	
Accessories and spares		☐	☐	☐	

Approval

We confirm that the AV system has been fully commissioned and tested in compliance with the University Standards.

Signed _____ _____

(RMIT Property and Services PM) Date

Signed _____ _____

(RMIT ITS PM Representative) Date

Signed _____ _____

(RMIT AV Representative) Date

Defect list

Defects identified during Audio Visual Quality Assurance in addition to any defects found during consultant and integrator quality assurance. Any additional information relating to previously identified defects will also be included below.

Item Affected	Corresponding AV Test Script No.	Defect ID no.	Defect Description	Comments	Owner

Note: The defect ID number will only be used if the defect has been previously identified and given an ID as part of the consultant and integrator QA process.

J. RMIT Asset Disposal Authorisation

Audio Visual Asset Disposal Authorisation

Date: _____ Integrator: _____

Location: _____ Contact: _____

Project: _____ Signature: _____

Instructions:

AV equipment not required by the University should be disposed of if the;

- Equipment/technology is out of date
- Equipment is not in working condition
- Cost to repair a faulty item cannot be justified

This form shall be used for all ITS AVS Assets that are removed from service. The form shall be filled in by the Integrator and sent to the RMIT representative for disposal instructions which may include, disposal, return, or relocation.

Asset Number	Serial Number	Make	Model	Part Number	Removed from	Reason for Asset Disposal/Disposal instructions

RMIT AV Rep: _____ Date: _____

Signature: _____

By signing this document both parties agree on the equipment that is being disposed of and the method, both parties should keep copies for future reference. This document should only be signed by authorised representatives from each party.

K. RMIT Standards Amendment History

Ref	Action	Notes
2.1.4	Addition	Proof of competency
2.3.1	Amendment	Lifter cabling
2.4.2	Amendment	Equipment
2.4.3	Amendment	Product selection
2.4.4	Amendment	Warranty details
2.4.5	Amendment	packaging, expectation on use of.
2.4.6	Amendment	packaging, expectation on use of.
2.4.7	Amendment	Certification documents
2.4.8	Addition	Install directive
2.4.9	Addition	duration of warranty
2.5	Revised	Lock information and sourcing
2.10.1	Addition	Lock reference
2.10.6	Addition	Snake Eye screws
2.10.9	Addition	Snake Eye screws
2.11.1	Addition	PDU Switched items
2.11.3	Addition	Correct operation
2.12.3	Revised	Section
2.12.4	Revised	Section
2.12.5	Amendment	Patch leads, HDMI standard
2.12.7	Addition	inclusion of AS 3080
2.12.8	Addition	Bend radius, patch leads
2.13.3.b	Revised	5.3 to 6 Viewing distance approval
2.14.6	Addition	IR requirements
2.15.1	Revised	HDMI standard
2.15.7	Addition	PTZ camera install
2.18.8	Revised	sufficient length but not excessive, Fly leads specified.
2.16.2	Addition	Formats of code
2.17.3	Addition	Final clean
3.1.1	Revision	Additions to Asbuilt deliverables.
3.1.1	Addition	Cat X test results.
3.2	Addition	Training documentation on electronic Asbuilt
3.4	Amendment	Contactor for Integrator
3.6	Addition	Supply as part of Asbuilt
3.7.3	Addition	additional equipment abbreviations
4.1	Amendment	Deletion of "or Teaching Space"
Drawings	Revised	All drawings revised, including equipment.
4.3.	Revised	system discription
4.5	Revised	Updated information